Railway Mechanical Engineer

Name Registered U. S. Patent Office

Founded in 1832 as the American Rail-Road Journal

With which are also incorporated the National Car Builder, American Engineer and Railroad Journal, and Railway Master Mechanic.

Editorial Contents for April, 1930

Volume 104 *No. 4*

Missouri Pacific Locomotives Shop-Standards Plan .... Page 181

This article describes a plan of man-hour control which the Missouri Pacific has developed with the objective of securing more accurate control of production than was formerly had with its shop scheduling system.

Draft Distribution in the Firebox .... Page 184

The St. Louis-San Francisco has adopted a grate arrangement which makes 25- and 35-per cent air openings in the firebox. S. H. Acker, assistant engineer of tests, has described in this article the results of tests on locomotives equipped with these two percentages of air openings.

Renovating Oil and Waste on the Delaware & Hudson .... Page 189

The Delaware & Hudson has built a modern plant for renovating oil and waste at Oneonta, N. Y., which is the result of several years experimental work.

MOTIVE POWER DEPARTMENT:
- Missouri Pacific Locomotive Shop-Standards Plan 181
- Draft Distribution in the Firebox 184
- Wabash Purchases Twenty-Five 4-8-2 Type Locomotives 203

CAR DEPARTMENT:
- Renovating Oil and Waste on the Delaware & Hudson 189
- Seasoning Wood at the Angus Shops of the C. P. 195

GENERAL:
- Selection of Apprentices for the Railway Shop 200

EDITORIALS:
- Curing Careless Welders 208
- Controlling Expenses 208
- Recognition of Railway Mechanical Progress 208
- Draft Control 209
- What Is a Hot Box? 209
- Convention Papers and Discussions 209
- Reciprocal Buying 210
- New Books 210

THE READER'S PAGE:
- The Definition of a Hot Box 211
- When Air Is Not "Free" 211
- Mechanics Needed—Not Specialists 211
- Letter on Apprentices Draws Fire 212
- Floating Bushings—Drilled or Grooved? 212
- Older Seat Designs Now Improved 213

THE CAR FOREMEN AND INSPECTORS:
- Underneath Inspection of Cars in Motion 214
- Decisions of Arbitration Cases 215
- Protecting Passenger-Car Journals 217
- A Holder for an Electric Burner 217
- Do You Know Why Some Cars Ride Hard .. 218
- Hanging Car Doors 220

IN THE BACK SHOP AND ENGINEHOUSE:
- Indexing Chuck for Main Rod Brasses 221
- A Valve-Stem Extractor 222
- Boring Air-Pump Head Caps 222
- A Valve Bushing Puller 223
- Spring Boring Bar and High-Duty Tool Post 223
- A Superheater-Unit Puller 224
- An Easily Removed Oil Cavity Cover 225
- An Enclosed Pipe Rack 225
- Boring Engine and Trailer-Truck Brasses ... 226

NEW DEVICES:
- Enginehouse Pit Crane 227
- A Heavy Duty Honing Machine 228
- U. S. Drills Redesigned 229
- The Beaver Four-Post Die Stock 229
- Boring Cylinders Integral With Frames 230
- The Roustabout Crane 230
- A Combination Disc and Floor Grinder 230
- Welding Bases for Motor-Generator Sets 231
- An Adjustable Drill Stand 231
- A Radial Drilling Stand 232
- The Hammond Disc Grinder 232

CLUBS AND ASSOCIATIONS 233

NEWS 236

Published on the first Thursday of every month by the Simmons-Boardman Publishing Company, 34 North Crystal Street, East Stroudsburg, Pa., and 30 Church Street, New York

SIMMONS-BOARDMAN PUBLISHING COMPANY, 30 CHURCH STREET, NEW YORK

Publishers also of Railway Age, Railway Engineering and Maintenance, Railway Electrical Engineer, Railway Signaling, Airway Age, Marine Engineering and Shipping Age, The Boilermaker, Locomotive Cyclopedia, Car Builder's Cyclopedia, and Railway Engineering and Maintenance Cyclopedia

Chicago: 105 West Adams St. Cleveland: Terminal Tower Washington: 17th and H. Sts., N. W. San Francisco: 215 Market Street.

Request for change of address should reach the New York Office two weeks before the date of the issue with which it is to go into effect. It is difficult and often impossible to supply back numbers to replace those undelivered through failure to send advance notice. In sending us your change of address, be sure to send us your old address as well as the new one.

Subscriptions, including the eight daily editions of the Railway Age published in June, in connection with the biennial convention of the American Railway Association, Mechanical Division, payable in advance and postage free: United States, Canada and Mexico, $3.00 a year; foreign countries, not including daily editions of the Railway Age, $4.00.

The Railway Mechanical Engineer is a member of the Associated Business Papers (A. B. P.) and the Audit Bureau of Circulations (A. B. C.)

Railway
Mechanical Engineer

Founded in 1832 as the American Rail-Road Journal

April, 1930

Missouri Pacific Locomotive Shop-Standards Plan

Method of man-hour control in locomotive repair shops helps secure marked increase in efficiency

Locomotive shops, Sedalia, Mo.

IN common with many other railroads, the Missouri Pacific, a few years ago, developed and inaugurated a shop schedule system for the prompt, orderly movement of locomotives and parts through the various shop departments while undergoing repairs. This system was helpful, but did not produce the desired results. Outgoing dates were hardly more than intelligent guesses, based on past experience and without anything like an exact knowledge of what could be accomplished. Moreover, there was not sufficient incentive to beat the schedule, once established.

It was decided, therefore, that a more definite plan of man-hour control, set up as a result of a detailed study of specific operations, would be of advantage and place the entire shop production on a more efficient basis. This plan, inaugurated early in 1928 in the erecting department at the locomotive shops at Little Rock, Ark., is not yet completely installed, but it became generally effective at Little Rock and in the locomotive shops at Sedalia, Mo., by January, 1929. The results in that year amply demonstrated its merits, as shown by the monthly performance figures charted in Fig. 1. There was a marked increase in efficiency at both major locomotive repair shops, from approximately 57 per cent in January to approximately 84 per cent in December. During the year, the man-hours per locomotive given Classes 1, 2 and 3 repairs were reduced 1,460 hours at Little Rock and 737 hours at Sedalia, this difference being largely due to the earlier and more complete installation of the shop-standards plan at Little Rock.

Monthly production figures also showed a fairly constant and commendable increase at both shops. As indicated in one of the tables, 220 locomotives were given classified repairs at Sedalia in 1929, as compared with 174 in 1928. The output of classified repairs at Little Rock was 231 in 1929, as compared with 185 in 1928. From the tabulation showing the division between Classes 1, 2 and 3 repairs, it will be observed that about equally heavy work was done at both shops, except in the case of Class 2 repairs at Little Rock in 1929, this relatively low figure being made up by an increased number of Class 3 repairs. The other table, indicating the number of shopping days per locomotive

for Classes 1, 2 and 3 repairs, shows a substantial and quite consistent decrease in each instance, the system average for all three classes of repairs being 25.7 days.

While other conditions such as modern machinery and shop facilities, size of force and general shopping policy all have a bearing on shop output and efficiency, the Missouri Pacific mechanical department officers and shop supervisors are generally agreed that the shop standards plan has been the most important single factor in the good results secured.

What the Shop Standards Plan Is

The shop standards plan comprises the development of departmental, or group, time schedules, based on many carefully-checked studies of individual operations which in the aggregate make up the group output. Allowances are made for individual shop conditions and for different types of locomotives, classified according to wheel arrangement. Piecework or a bonus system are not contemplated, nor does the plan involve keeping daily records of individual performances at greatly increased expense for inspection and clerical work. The plan does, however, set up an intelligent measure of group performance which can be readily checked with slight additional clerical work and the results broadcast throughout the respective shops, with two primary objects in view; namely, to call attention to and permit improving low-efficiency groups, and to encourage friendly competition between groups above the average in efficiency.

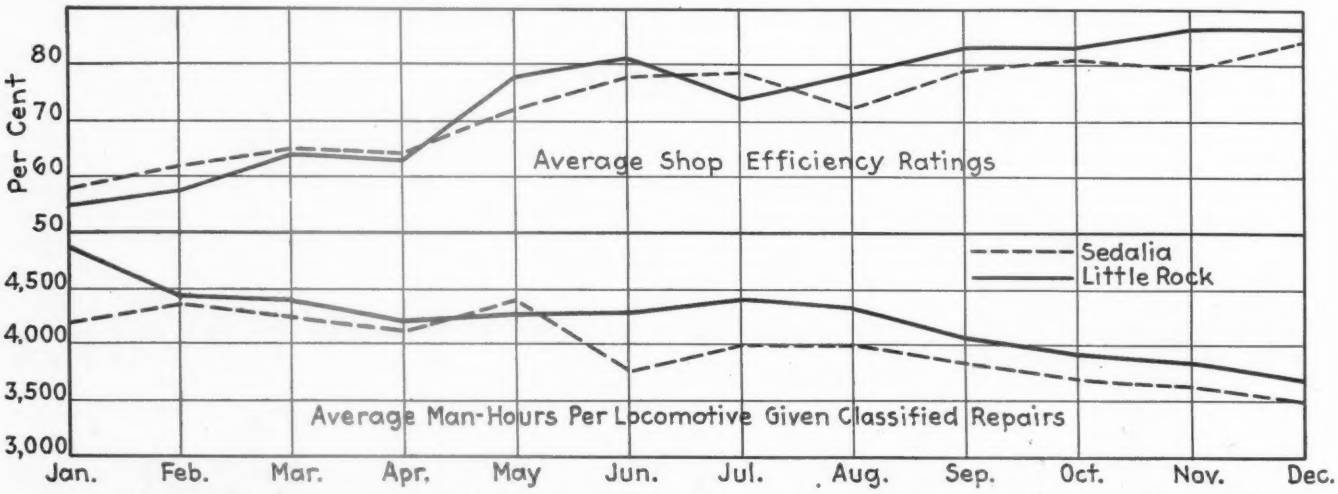


Fig. 1—Comparative monthly performances in 1929 of the two largest Missouri Pacific locomotive shops.

Table Showing Comparative Monthly Output and Classification of Locomotive Repairs

	Sedalia 1928	Sedalia 1929	Little Rock 1928	Little Rock 1929
January	10	16	16	17
February	12	18	15	17
March	17	18	18	18
April	14	19	16	20
May	15	18	19	16
June	14	19	9	18
July	15	21	16	22
August	16	22	17	22
September	13	23	16	25
October	18	23	17	24
November	16	14	13	16
December	14	14	13	16
Total	174	220	185	231
Class 1	6	6	7	7
Class 2	23	26	21	11
Class 3	145	188	157	213
Total	174	220	185	231

The efficiency of any group over a given period of time is, of course, the ratio of shop standard man-hours allotted for the particular work done, divided by the actual man-hours required. This operating ratio, as it is called, seldom reaches 100 per cent, which would be considered a highly creditable performance.

In establishing the standard schedules, the time of each group of workers handling specialized units is analyzed. Schedules are furnished for every department and group of related parts for each type of power, a typical stripping schedule being shown in Fig. 2. Each schedule is designated by a symbol composed of three identifying units: (1) Departmental symbol; (2) letter to designate group of parts covered; (3) designation of number of schedules in the classification. When completely installed, the plan will comprise about 600 similar group-time schedules in the locomotive department.

MISSOURI PACIFIC LINES SHOP STANDARDS

Engine No.: ______ In Date: ______ Out Date: ______

Department: ______ Foreman: ______

STRIPPING SCHEDULE

Schedule No.: 1-W-2 Mikado Type Eng.Nos.: 1201 - 1570

INCLUDES: - Removing, stenciling and delivering following parts when engine is to receive classified repairs: - Cylinder, piston valves, steam chest, casings; motion work; guides and pistons; main and side rods; carrying gear; engine truck tie bars; cellars and boxes; brake rigging, driving wheel boxes and binders; throttle rigging; steam pipes, boiler mountings; cab and running boards and brackets; all air and steam piping, dome course, jackets and lagging; air brake parts; other boiler parts, including front end grate rigging; grates and side bars, flues, draw and safety bars; reverse shaft and bolts; pilot with beam and braces; smoke stack; sand box, boiler check valves; generator, pump and headlight brackets; units, brake shaft; smoke arch braces and flues; cylinder back head.

(When necessary, extra allowance will be made for additional work)

STANDARD ALLOWANCES - For items above	Man Hours	Allowed Hours
Class 1 Repairs	115.0	
" 2 "		
" 3 "	95.0	
" 4 "		
" 5 "		

EXTRA ALLOWANCES - Class	1	2	3	4	5	
Frame		20.2	20.0			
Firebox		20.0				
Tee Head			1.2	1.2	1.2	
Superheater Header			1.0	1.0	1.0	
Stephenson Valve Gear - (Extra Allowance		5.0	5.0	5.0	5.0	
Dry Pipes		2.5	2.5	2.5	2.5	

Total Standard Hours ______
Actual Hours ______
Rating ______

Fig. 2—Typical stripping department standard time schedule for a Mikado locomotive

MISSOURI PACIFIC LINES

Shop Standards

DAILY REPORT OF DEPARTMENTAL RESULTS

SHOP NORTH LITTLE ROCK DATE JANUARY 28, 1930.

DEPARTMENT	MAN HOURS TODAY		MAN HOURS 25 DAYS		25 DAYS DEPARTMENTAL OPERATING RATIO
	Charged	Credited	Charged	Credited	
Stripping	114.0	95.00	2470.5	2319.40	93.9%
Truck	24.0	23.00	545.0	510.00	93.6
Erec.Gang No.1	164.0	160.29	4241.5	4019.59	94.8
Erec.Gang No.2	168.0	96.75	4259.5	4157.83	97.6
Erec.Gang No.3	188.0	153.78	4484.5	4340.29	96.8
Erec.Gang No.4					
Erec.Cab Gang	240.0	306.56	5982.5	5255.90	87.9
Boiler Mfg.Dept.	400.0	305.84	9150.0	8260.25	90.3
" Cab & Tank	416.0	486.76	10979.0	9960.61	90.7
" Erecting	536.0	448.54	13668.5	12327.64	90.2
Wheel & Box					
Rod Dept.	72.0	45.97	1716.5	1502.38	87.5
Link & Motion	291.5	259.47	7804.0	6973.38	89.4
Machine (Misc)					
Brass Dept.					
Air Room					
Pipe Shop					
Blacksmith Shop					
Locomotive Paint					
SHOP TOTALS	2613.5	2381.96	65301.5	59627.27	91.3%

Engine Input (6421 Cl.3) 1 Pit Condition 15

Engine Output (2320 Cl.3-Gang 2) 1 25 Day Engine Output 28

Fig. 3—Daily report showing operating ratios for the shop and by departments

At present it is not fully applied in the machine shop or in the blacksmith shop. The detailed operations involved in stripping Missouri Pacific Mikado-type locomotives 1201 to 1520 are shown in the stripping schedule, Fig. 2, which also gives at the bottom the extra man-hour allowances for unusually heavy work in each class of repairs.

The operating ratio for each department is computed daily on a periodic basis, as detailed in Fig. 3, which shows the departments in which the shop standards plan has already been installed. The work of keeping this record has been reduced to a minimum. The work is

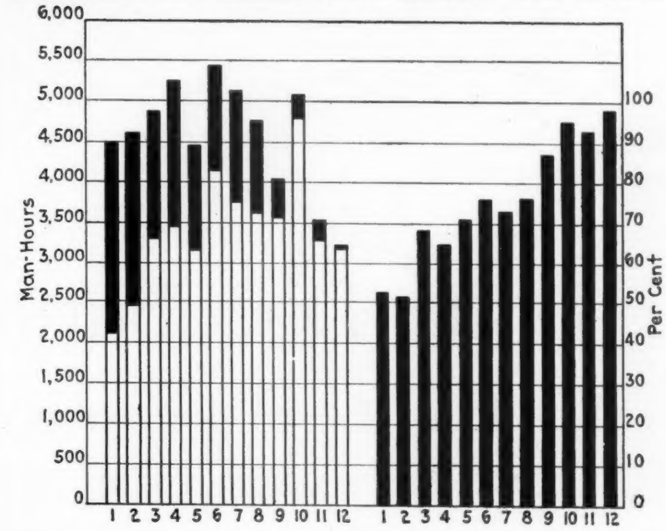


Fig. 4—Typical erecting-gang graphic chart—Solid areas (left) show man-hours consumed over schedule per month in 1929—Solid areas (right) indicate monthly departmental efficiency

placed in charge of a production supervisor and two assistants, and printed schedules are furnished for every department. To insure exact knowledge of their departmental output, at the end of each day, the foremen are called upon to tally on these schedule sheets the

(*Concluded on page 201*)

Stripping operations at Missouri Pacific shops, Little Rock, Ark.

The 2-8-2 type locomotive on which the tests were run

Draft Distribution in the Firebox

Results of Frisco draft tests on locomotives equipped with two precentages of air openings in the same firebox

By S. H. Acker

Assistant Engineer of Tests, St. Louis-San Francisco

THE adoption of a grate arrangement on the St. Louis-San Francisco giving 25 per cent air opening in the front of the firebox and 35 per cent has caused considerable comment at various times. Some railroad men have taken exception to the use of two percentages of air openings in the same firebox. Most of these exceptions are based on false premises. A comment made at the Traveling Engineers' Association in 1929 fairly represents the character of these comments. This is as follows: "Naturally where you have the most air you are going to do the most burning, when you are utilizing the capacity of the machine. If the draft is not equalized over the grate area as a whole through the flues, something is going to happen. Show me the machine or show me the man that you can tell to burn 25 per cent here and 35 per cent there, and the remaining portion in some other part of the firebox, and he is more than human."

The first statement in the quotation may be accepted as true, provided fuel is present in sufficient quantities to utilize the air passing through the fuel bed. The balance of the question shows that the underlying principles of the grates with two proportions of air openings and the results obtained by their adoption are not generally recognized because the information obtained during the tests when these grates were developed has not been given sufficient circulation.

The test locomotive on the road

This article is written for the purpose of presenting this information, together with such comments and examples as seem necessary to make a complete explanation of the principles underlying the design of these grates and the results obtained by their adoption for service.

Prior to the development of the 25-35-per cent grates the Frisco was experiencing trouble with pulling fires when starting tonnage trains out of terminals against a heavy grade. In an effort to check this trouble a set of test runs was authorized in 1927. The first of these tests was conducted between Tulsa, Okla., and Sherman, Tex., where the most trouble was experienced in maintaining proper fires. Later the tests were extended to other divisions where different coals were used and different operating conditions were encountered.

Conditions Under Which the Tests Were Made

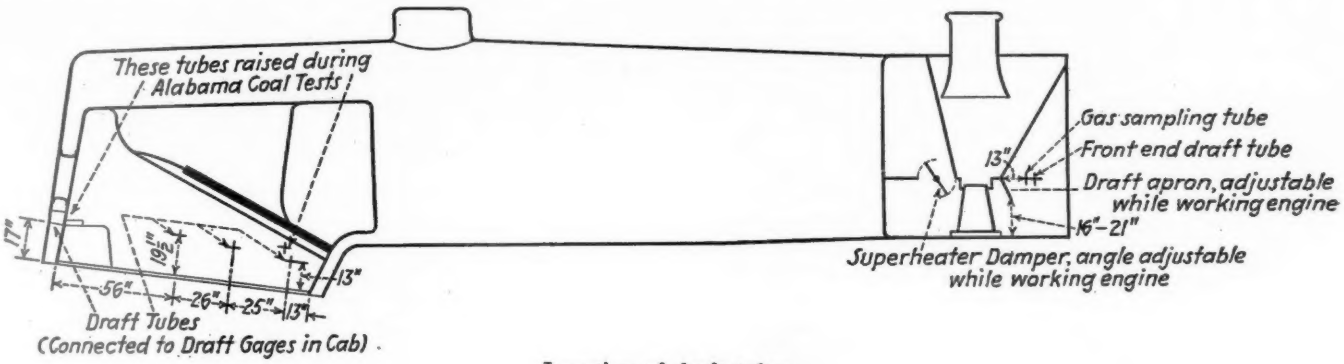
The locomotive selected for test was No. 4158. This locomotive is of the Mikado type used in freight service between Kansas City, Mo., and Sherman, Tex., Kansas City and Birmingham, Ala., Springfield, Mo., and Tulsa, Okla. The data for this locomotive are given in the table.

The first coal used was Henrietta (Oklahoma) run-of-mine, as this was the standard fuel on the district where the original tests were run. Later the locomotive was tried on other districts with Kansas and Alabama coals. The locomotive had to be

drafted to burn all these varieties of coal. The analyses and characteristics of the fuels burned are given in the table so that the nature of the problem may be more easily understood.

The Henrietta coal is light and is easily pulled away from one portion of the firebox. A locomotive drafted end. The draft plate was constructed so that it could be adjusted instantaneously on the road. Draft readings could then be taken under identical firing and operating conditions for any draft-plate settings between 16 and 21 in.

The grates in the locomotive at the start of the tests



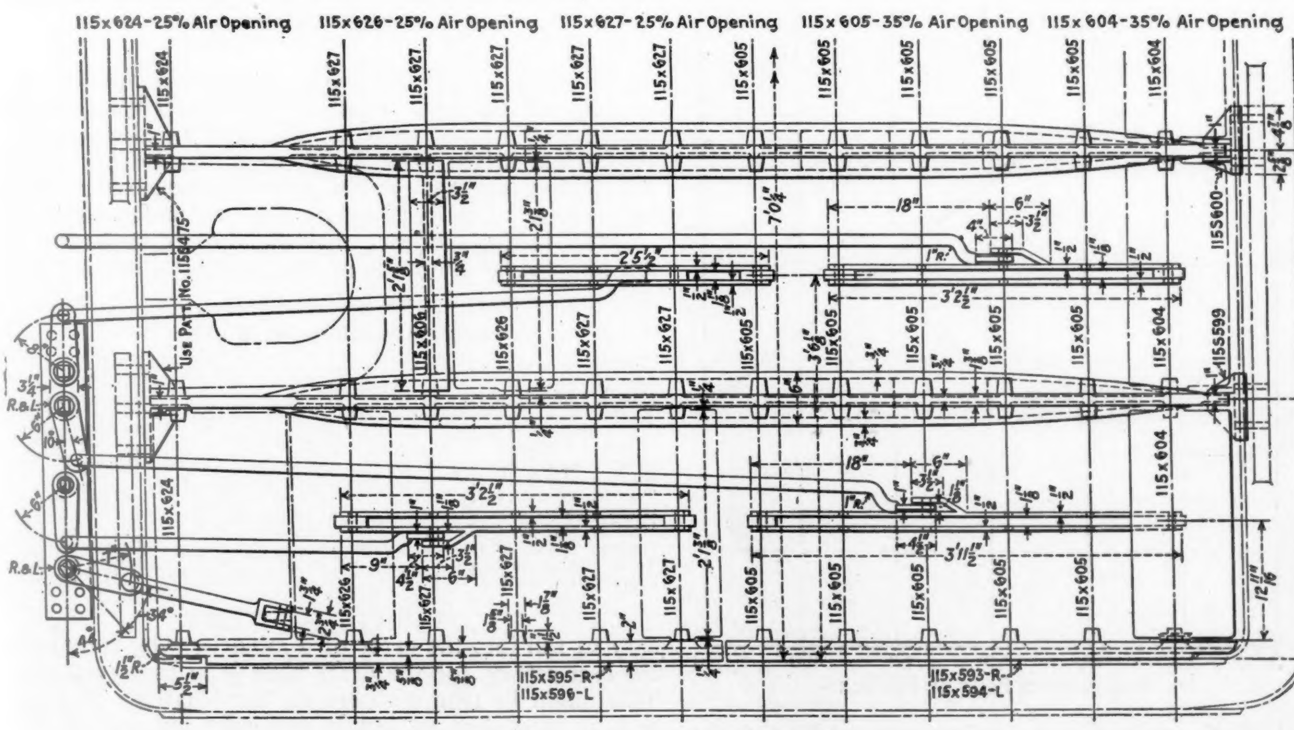
Location of draft tubes

for the heavier Kansas coals is likely to pull holes in a fire of Henrietta coal. Much trouble was experienced on account of the tendency of Kansas coal to clinker badly. When burning this coal, if the locomotive is not drafted sharp enough, or if the fire is banked or healed, a clinker will form immediately. The Alabama coal burned by the Frisco will not clinker easily but the ash builds up rapidly. The ash will fuse together enough to keep it from being carried away by the draft, but it is very light and will build up to several inches in depth in a few miles. In fact, when locomotive 4158 was run in Alabama coal territory it was found necessary to raise the draft tubes referred to later to prevent the ash from covering them.

Draft tubes were placed in the front, center and rear of the firebox and in the smokebox. Later a draft tube was placed between the front and center tubes in the firebox. Flue gas samples were taken from the front were of the table type, with slotted air openings equal to 35 per cent of the area over the entire firebox. A closed arch (sealed against the throat sheet) was used.

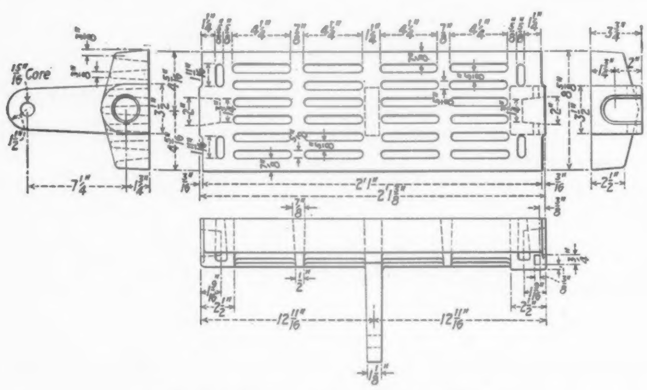
The regular practice of the firemen was to carry a heel in the fire. They maintained that the heel was necessary to prevent the draft from pulling holes in the fire, particularly on the heavy grade out of the Tulsa yards. In studying this condition an attempt was made to carry an absolutely level fire on the first experimental runs, but it was found that this could not be done on the first heavy grade. After the locomotive had been on the road for some time a level fire could be maintained by firing the back corners of the firebox with a scoop at rather frequent intervals.

The high consumption of fuel in the back corners and the pulling of fires in the back corners indicated too high a draft in the back of the firebox. The draft readings also indicated a much heavier draft in the rear



Arrangement of the grates with 25- and 35-per cent air openings

of the firebox than in the front. The curve, Fig. 1, shows the average proportions of draft readings in the front, center, and rear of the firebox, with a level fire. The abscissae of this curve are the inches from the rear of the firebox and the ordinates the ratio of draft to the draft at the rear of the firebox; that is, the draft 13 in. from the front of the firebox (107 in. from the rear) was 70 per cent of the draft in the rear. Fig. 2 shows the same proportions of draft readings in a fire-



Grate with 35 per cent air opening

box with a banked fire, the draft 13 in. from the front of the firebox being, in this case, 80 per cent.

Effect of Altering Draft-Plate Height

It is rather generally assumed that raising the draft plate increases the proportion of total air drawn through the grates in the rear of the firebox of an arch-equipped locomotive as compared with the balance of the grates of the firebox. Conversely, the lowering of the draft plate is generally assumed to increase the proportion of air drawn through the front grates. In the case of a locomotive not equipped with an arch the effect was presumed to be reversed.

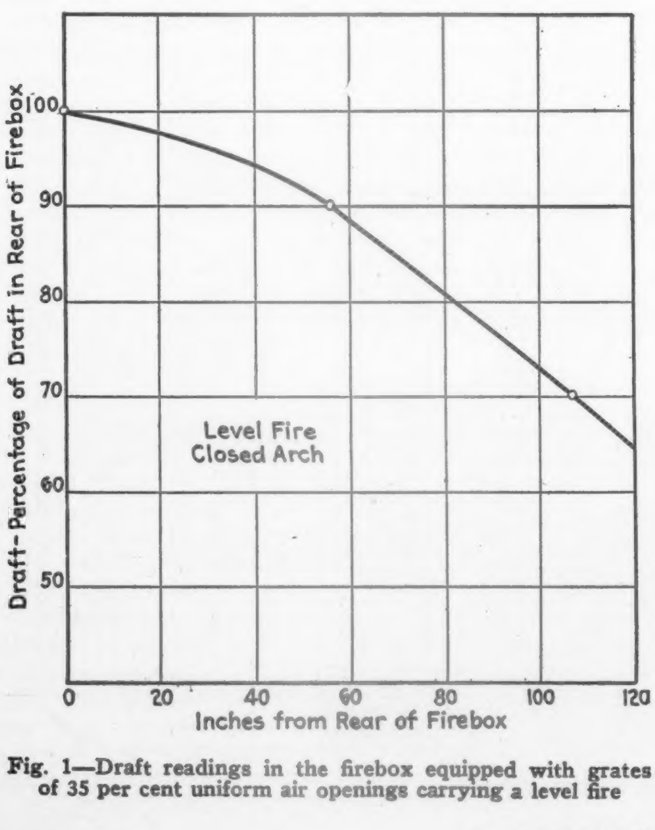


Fig. 1—Draft readings in the firebox equipped with grates of 35 per cent uniform air openings carrying a level fire

The problem of equalizing the draft in a firebox under these premises would be simply the location of the proper height for the draft plate. The quotation given at the beginning of this article states: "If the draft is not equalized over the grate area as a whole *through the flues,* something is going to happen." Now the flues in a locomotive are fixed. The idea intended to be conveyed is that the draft plate should have been used to equalize this draft rather than to attempt to control the air supply with the grates.

Acting upon the assumption that the draft through the grates could be distributed by the draft plate, the draft plate on locomotive 4158 was lowered and raised

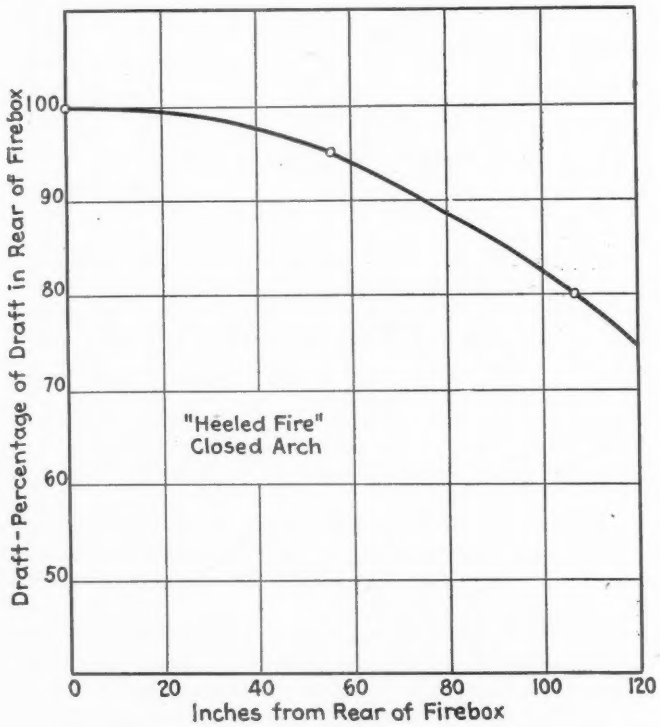


Fig. 2—Draft readings in the firebox eqiupped with grates of 35 per cent uniform air openings carrying a banked fire

in an effort to find the height that would equalize the air through the fire, but always the draft was greater in the rear of the firebox. The sudden alteration of draft-plate height from 16 in. to 21 in. did not affect distribution of draft in the firebox between the front and rear at all, as recorded by the instruments used.

After having evidence that the draft distribution is not affected by alteration of the draft-plate height, it is

Locomotive Data—4150 Class

Type	2-8-2
Service	Freight
Fuel	Bituminous
Built	Baldwin—1925
Valve gear	Walschaert
Weight on drivers	261,700 lb.
Weight engine and tender	280,000 lb.
Boiler pressure	200 lb.
Tractive effort	62,950 lb.
Grate area	70.3 sq. ft.
Heating surface—firebox	380 sq. ft.
Heating surface—flues	3,681.4 sq. ft.
Total heating surface	4,061.4 sq. ft.
Superheating surface	993.0 sq. ft.

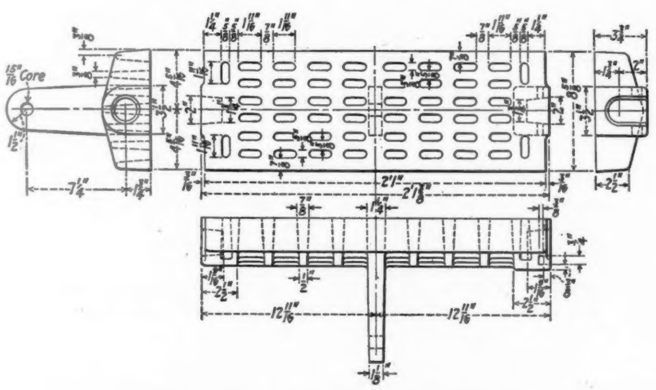
easy to fall into the error of a minority who state that the best setting for the draft plate is in the scrap pile. This might be true with certain combinations of fuels and drafting devices. but is decidedly not true in the majority of cases. The draft plate performs a function

which has been mistaken as draft distribution according to location in the firebox, while actually it distributes the draft according to time.

It is difficult to stretch the imagination to a point where it can visualize altering the height of the draft plate in the front end a few inches to cause the air and products of combustion to alter the course of their travel through the front or back of the firebox, yet this theory has gained rather wide acceptance. What led to accepting this theory is the fact that the lowering of the draft plate would sometimes stop a locomotive from pulling a fire in the rear of the firebox in an arch-equipped locomotive, or in the front of the firebox of a locomotive without an arch.

Confining the discussion to arch-equipped locomotives for the present, two conditions prevail when a locomotive pulls a fire: First, the locomotive is working hard at long cut-off and slow speed, and, second, the hole is pulled in the rear of the fire.

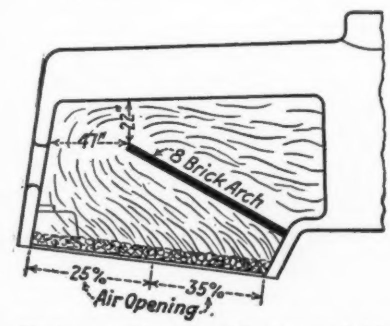
The first condition indicates that it is not the high average draft that tears the fire, because much of the time the draft reading in the front end and firebox are much lower while the fire is being torn than at some higher locomotive speed where the horsepower of the locomotive is much higher and the draft is greater. The trouble is in the high momentary drafts as a cylinder full of steam is exhausted through the nozzle at high release pressure. The draft plate governs the restriction through which the products of combustion have to pass to reach the front end. With no draft plate at all they would rush into the front end as rapidly as the resistance of the tubes and arch would allow them to flow and as the resistance of the grates and fuel bed would allow the air to enter the firebox. The changes in draft in the front end would be carried rapidly to the firebox and the effect would be heavy maximum drafts at low speeds and long cut-offs. These high maximum drafts will tear the fire at the point of heaviest draft, which is the rear end of the fire. Lowering the draft plate cuts down the pulsating effect of the heavy exhausts at low speed and distributes the draft more uniformly with respect to time.



Grate with 25 per cent air opening

Lowering the draft plate will eventually stop the tearing action of the draft if carried far enough. It is impossible to lower the draft plate enough to tear the fire in the front end of a locomotive with arch against the throat sheet. If the lowering of the draft plate throws the draft to the front of the firebox, why doesn't the fire tear under the toe of the arch when the draft-plate setting is too low? It would be possible, of course, by carrying a much heavier fire in the rear or by having a bad clinker to tear the fire under the arch. The thin fire in the front of the firebox would not require as much force to lift it as the heavy fire on the rear grates and consequently would be the first to be carried away. As long as the fire conditions are uniform, however, the back grates form the danger point.

A study of the drawings showing the firebox arrangements should be convincing that the draft will be heavier in the rear of the firebox. Consider the 27-in. maximum clearance between the arch and crown sheet. All the products of combustion must pass through this opening. The air pressure on the bottom of the grates is practically uniform. With uniform grate openings and level fire the resistance of the longer and more tortuous path of the gases from the front end of the firebox will be greater than the path of the gases from the rear of the firebox.



Firebox equipped with 25- and 35-per cent grates showing an even fire under severe firing conditions

This is amply proved by the draft readings. The path from the rear of the firebox was enough easier for the gases to pursue that the actual pull of the drafts in the front of the firebox is only 70 per cent of the pull in the back end. The resistance of the grates and fuel bed being the same front and rear, the back end of the firebox will get the most air because of its higher draft, and "where you get the most air you are going to do the most burning." So apart from the tendency to pull fires there is an important object to accomplish in equalizing the combustion over the firebox.

Effect of Fire Conditions on the Distribution of the Draft

The bank around the stoker-protecting grate and along the dump grates in the rear of the firebox (general practice firing grates with uniform openings) was carried to keep the draft from jerking holes in the fire in starting from terminals and to keep the fire from burning too rapidly in the rear. By introducing additional resistance at the point of greatest draft these objects were accomplished. The added resistance of the bank in the rear of the firebox forced the front portion of the grates to supply more air. The ratio of the draft in the front of the firebox to that in the rear was raised from 70 per cent to 80 per cent. Added to this was the increased resistance of the fire in the rear, in the ideal case causing equal combustion over the entire grate area. However, this ideal is far from realized; while one fireman carries a small heel, another has a mass of fuel that can be called nothing but a bank.

When these banks get too high they will not burn at

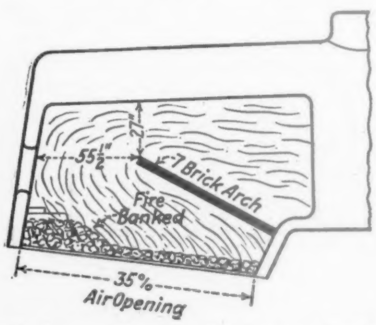
Analysis of Coals Used in the Tests

	Henrietta, Okla. Run of mine.	Kansas Run of mine.	Alabama. Run of mine.
Volative and combustible	34.64%	31.70%	32.79%
Fixed carbon	54.52%	53.25%	52.73%
Ash	10.84%	15.05%	14.48%
	100.00%	100.00%	100.00%
Sulphur	2.27%	4.08%	2.03%
Total moisture	5.95%	6.75%	4.33%
B.t.u.	13,180	12,300	12,380

all, cutting down the effective grate area. The use of a heel in the fire is not to be recommended over any mechanical adjustment which will properly distribute the draft over the grates.

The Effect of Air Openings and Thick Fires

The use of proportionally restricted air openings in grates tends to equalize the draft distribution throughout the firebox of a locomotive by making the resistance of the grates such a large proportion of the total resistance that the effect of the differences in the resistances of the paths of gas travel between the fuel bed and the area between the arch and the crown sheet becomes a smaller proportion of the whole. Even with 11 per cent or 13 per cent uniform air openings there is some difference in draft over the fire, however. A thick fire bed will act the same as restricted grate openings in partly equalizing the percentage of resistance of the various paths of gas travel by increasing the uniform portion of the resistance.



Firebox equipped with grates of uniform air openings showing the fire banked in the rear to prevent pulling

The restricted grates perform another duty. They decrease the pulsating or blasting effect of the exhausts at low speed. On ordinary grates lignite coal would be carried out the stack in the first few exhausts because it is too light to resist the heavy push of the air in the ash pan trying to work its way to the smokebox to relieve the high momentary vacuum. The restricted grates, like the draft plate, present a high resistance to this air pressure, and the pressure on the bottom of the fuel bed is decreased by the resistance of the grates. The restricting of the grates to form a resistance to the flow of air should not be overdone, however, because all the resistance introduced into the path of the air and gas travel will use up power. The power comes from the exhaust and as little should be used as possible, since every particle of energy lost in the exhaust steam costs that much energy in useful work in the cylinders.

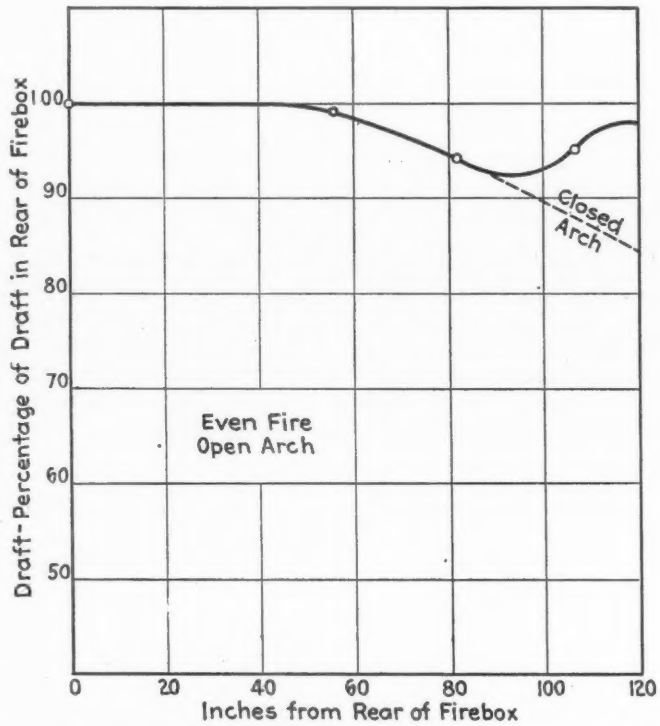


Fig. 4—The draft readings in the firebox equipped with an open arch and 25- and 35-per cent air openings

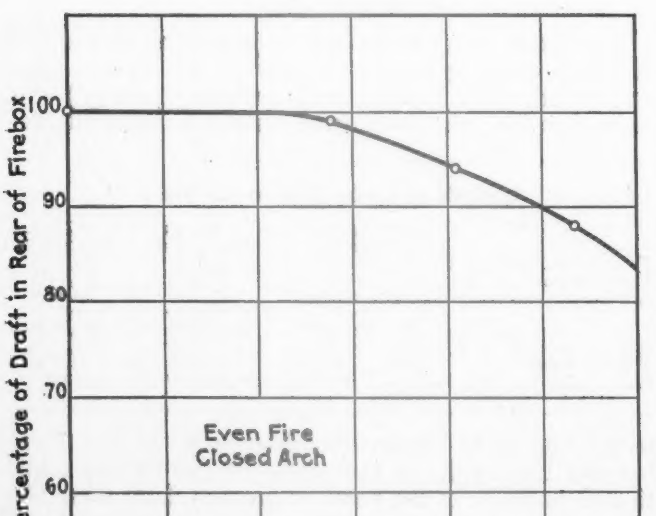


Fig. 3—Draft readings in the firebox equipped with a closed arch and grates with 25- and 35-per cent air openings

The Theory of the 25-35-Per Cent Grates

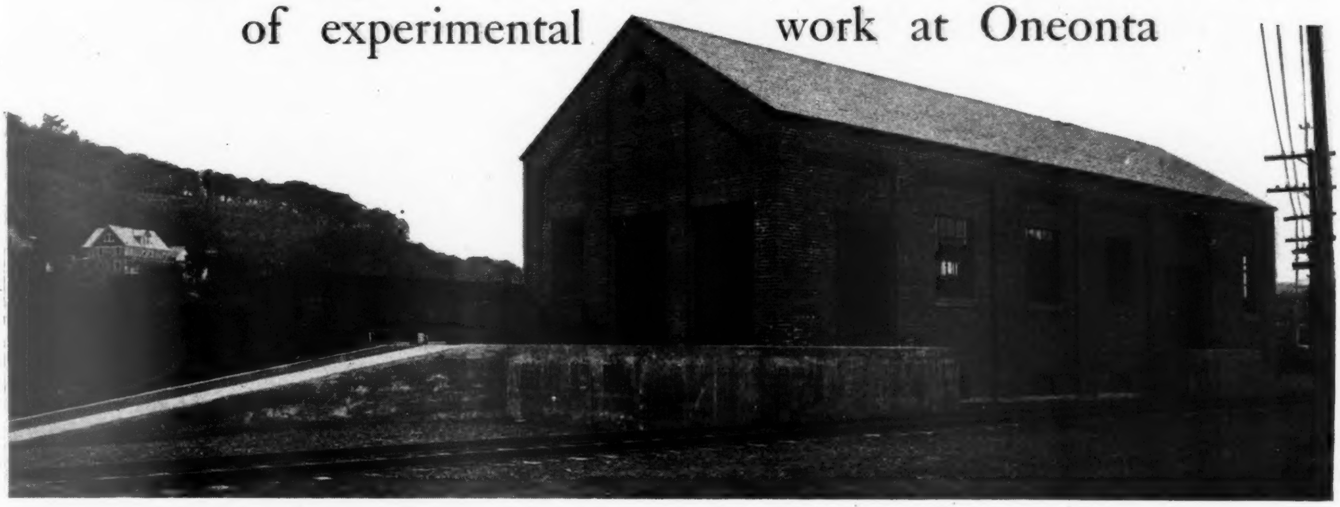
Since it is impossible to distribute the draft properly from the front end and with a closed arch the draft is always heavier behind, it follows that the proper way to control the air distribution to the fire is to introduce a resistance greater at the points of greater draft and less at the points of less draft. Theoretically, the air openings should be gradually tapered down from the rear of the firebox to the front. In practice it is not possible to carry and apply the variety of grates that would be required. The practicable thing to do seemed to be to use grates with two percentages of air openings. Accordingly, during the experiments the openings through the rear grates were closed to 25 per cent with steel strips across the centers of the slots and the front grates left with 35 per cent air openings.

The application of the steel strips on the rear grates stopped the tearing of fires and a level fire was easily maintained at all times. The draft readings were relatively higher in the front of the firebox when compared with the draft readings on the grates with uniform openings of 35 per cent, as may be seen in Fig. 3. The combustion improved as there were no banks to distill off hydro-carbons without sufficient air for combustion.

(*Concluded on page 207*)

Renovating Oil and Waste on the Delaware & Hudson

Efficient plant is developed after several years of experimental work at Oneonta



Waste renovating plant of the Delaware & Hudson at Oneonta, N. Y.

SIX years ago, the Delaware & Hudson initiated steps to secure an improvement in freight-train operation by reducing the number of hot journals occurring enroute and at terminals. Investigation of various phases of the problem disclosed that the most important was the securing of effective lubrication. To accomplish this, measures were taken to see that a proper grade of oil was used in journal boxes, as well as packing which would deliver the oil to the journal. Special attention was also given to the instruction of car men engaged in the packing of journal boxes to see that A.R.A. instructions were carried out.

All hot journals were reported on a special form. This form showed the date, train number, station, length of detention, and the initials and number of the car. Entry spaces were provided for the size of the journal, various mechanical defects, the kind of waste in the box, the condition of the packing, the cause of heating and whether or not the car was overloaded. At the close of each month a summary was made of the various causes of hot boxes, and a monthly report was compiled which showed the number of failures, the car mileage per failure and the major contributing causes.

On the chart showing the passenger and freight car miles per hot box it will be noted that the mileage began to show a decided improvement shortly after this system went into effect. This improvement continued until 1927, when there was a decided decrease in passenger car-miles per hot box, although the freight-car situation continued to improve.

New oil and waste was used in passenger-car boxes at that time. Reclaimed oil was used to a considerable extent in freight-car journal boxes. An analysis of this reclaimed oil showed 45 per cent moisture, 5.98 per cent insoluble carboniferous matter and 8.81 per cent ash. The viscosity, flash, fire and pour points could not be determined on account of the dirtiness of the oil. This analysis was made July 1, 1927.

The Experimental Plant

Oil and waste reclaiming plants were located at Carbondale, Pa., Colonie, N. Y., and Oneonta. The first two plants were abolished and the work of reclaiming oil and waste was concentrated at Oneonta, which was a good distributing point on account of its central location on the system. Furthermore, concentrating this work at one central point facilitated the study of reclaiming oil and waste which the management desired to undertake.

The layout of the old plant at Oneonta was revamped without much expense. A revolving metal cylinder, (tumbler) shown in the center background of the interior view of the experimental plant, was added to the equipment for removing short fibre and foreign substances from the reclaimed waste. A machine was also devised for making back-end rolls.

Briefly, the waste was reclaimed by being picked over on a picking table, submerged in a bath of hot oil (120 deg. F.), allowed to drain on a rack, placed in a centrifugal machine for further extraction of the oil, passed through the tumbler and submerged in a bath of reclaimed or new oil at 190 deg. F., where it soaked for two hours. The waste was then allowed to drain and finally placed in the press, which is shown at the left of the illustration showing the interior of the experimental plant. The product of this plant contained approximately 3½ pt. of oil to 1 lb. of waste.

The process of reclaiming oil was comparatively simple. The oil flowed from the centrifugal machine, after being extracted from the waste, and was passed through a heated baffle-plate filter, located under the floor, into a storage tank. It was pumped from this tank into a boiling vat where it was subjected to heat

Interior of the experimental plant—The tumbler is shown in the center background—The chute at the right leads from the centrifugal machine

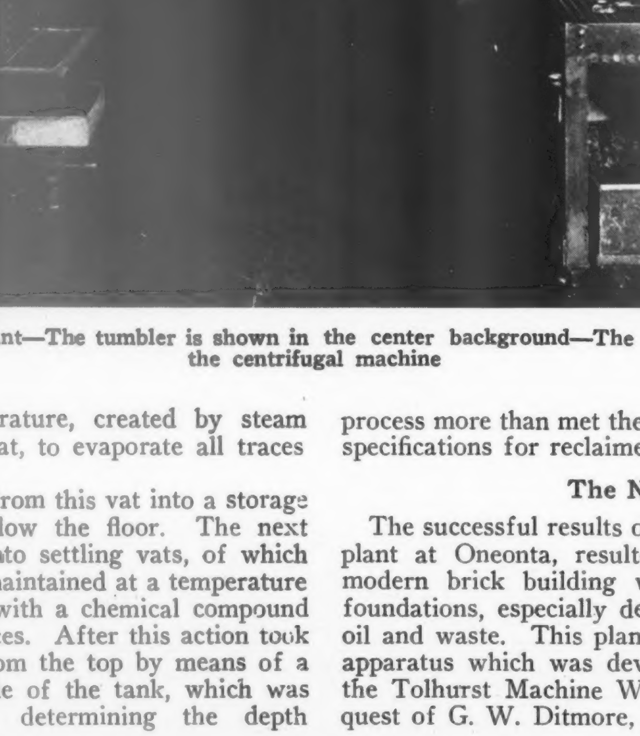
treatment at a high temperature, created by steam coils in the bottom of the vat, to evaporate all traces of water.

The oil was then drained from this vat into a storage tank which was located below the floor. The next operation was to pump it into settling vats, of which there were two, where it is maintained at a temperature of 140 deg. F. and treated with a chemical compound to settle the foreign substances. After this action took place, the oil was drawn from the top by means of a telescoping pipe in the inside of the tank, which was a novel arrangement for determining the depth of good oil in the vat. The oil flowed through this pipe to a storage tank in the basement of the building. The quality of the finished product was ascertained by immersing a clear strip of glass. When all traces of impurities had disappeared, the oil thus reclaimed was considered satisfactory for use.

The sludge or sediment found at the bottom of the vat was released through valves and used as a rough lubricant for center plates, side bearings, etc. Following is an analysis of the oil reclaimed by this process:

Flash	300 deg. F.
Fire	355 deg. F.
Pour, high	10 deg. F.
Viscosity at 210 deg. F.	51 sec.
Precipitation number	0.33
Moisture	Trace

This analysis shows that the oil reclaimed by this process more than met the requirements of the A. R. A. specifications for reclaimed oil.



The barrel washers

The New Plant

The successful results obtained with the experimental plant at Oneonta, resulted in the construction of a modern brick building with concrete platforms and foundations, especially designed for the renovation of oil and waste. This plant is equipped with renovating apparatus which was developed and manufactured by the Tolhurst Machine Works, Troy, N. Y., at the request of G. W. Ditmore, master car builder, Delaware & Hudson. It is operated under the supervision of the car department, and supplies packing for motive power as well as for freight and passenger cars. The maintenance of way department also uses some of the by-products of the plant for the lubrication of switches, interlocking, etc.

The building is approximately 30 ft. wide by 80 in length, with an oil-storage tank room 11 ft. by 33 ft. built at the rear on the basement level. An elevator facilitates the handling of material between floors.

An office, locker and dressing room, fitted with individual metal lockers, is located at one end of the building. This room adjoins a room containing a tiled shower bath, lava-

tory facilities, and a drinking fountain.

A layout of the tanks, vats and other equipment is shown in the two drawings of the ground-floor and basement plans. Three rectangular tanks, each having a capacity of 3,500 gal. and heated with steam coils, are ranged along one side of the basement. On the plan drawing of the basement, tank *A* is used for accumulating the dirty oil extracted from the packing by a centrifugal machine which is located on the floor above. Tanks *B* and *C* are used alternately for accumulating and boiling the oil. The oil in these tanks is subjected to heat treatment to evaporate the water content. Electrically driven centrifugal pumps, of which there are three, pump the oil from these tanks to the vats, extractor, clarifier, and settling tanks on the floor above.

Dumping an inbound container of used packing into an extractor basket—The oil clarifier is shown at the right

A washing machine for cleaning wiping waste is also installed in the basement. Facilities are to be provided later for supplying the railroad's requirements of locomotive journal compound.

To simplify the tracing of the many pipe lines, each has been assigned a color which indicates the service for which it is used. The colors used are:

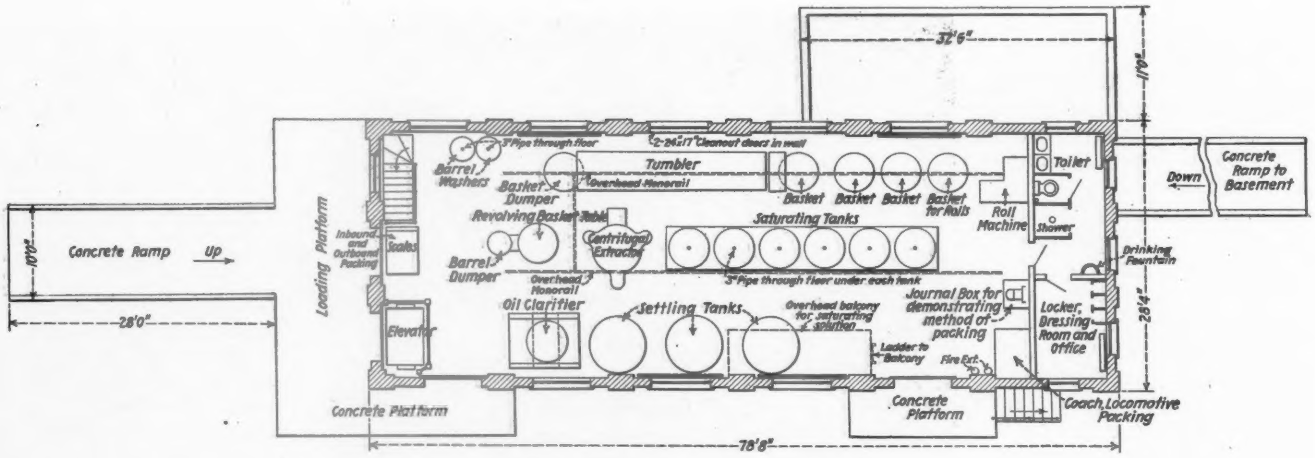
Renovated oil	Red
New or reconditioned oil	Light green
River water	Blue
City water	Aluminum
Sewage	Gray
High-pressure steam	Black
Air lines	White
Electric conduits	Olive green

Bar-handle four-wheel platform trucks and overhead mono-rail electric hoists, are used for handling the extractor basket. Special two-wheel trucks, provided with a bale, enable one man to pick up and remove with ease a metal container loaded with packing.

Renovating the Waste

Referring to the floor plan, packing removed from the journal boxes is delivered to the plant in steel containers, and weighed and recorded at the platform scales, which are located at the entrance to the plant. The containers are then moved to the barrel dumper where the contents are emptied into one of the removable baskets of the centrifugal extractor which is placed on a revolving table. The empty container is then taken to one of the barrel wash-

Interior of the new plant looking toward the scales—The three oil settling tanks with the chemical tanks overhead are shown at the left



Layout of the equipment on the main floor

ers and held inverted over a pipe in the center of the wash rack through which a jet of renovated oil is projected to remove any dirt that may remain in the container. The oil used and recovered in this operation, after passing through a coarse screen, is deposited in the dirty-oil tank *A* in the basement.

The packing in the basket is then subjected to treatment in the centrifugal extractor to clean it, hot renovated oil being pumped from tank, *B* or *C*, into the extractor basket while the machine is being rotated slowly. A timing device on the extractor is set and the extractor is operated at a high speed for 15 min. until most of the oil is forced out of the packing. The oil carries with it much of the dirt and other foreign matter as it flows from the extractor through a drain pipe to tank *A* in the basement. The period of extraction is controlled by the timing device which automatically stops the extractor. The waste-laden basket is then removed and conveyed by the overhead crane to the basket tilting table which is located at the in-bound end of the perforated cylindrical tumbler.

The waste is then passed, either by hand or mechanical feeder, into the elevated end of the tumbler. This method affords an opportunity to open up any tight rolls and remove any large lumps of foreign matter. As the waste passes through the tumbler, it is loosened by the tumbling action and the short ends and dirt sift through the perforations. Such refuse is caught in a chute under the tumbler and removed through one of the three metal doors in the wall of the building. This tumbler revolves on an axis slightly inclined from a horizontal position and the waste is discharged in a fluffy condition at the lower end into an extractor basket.

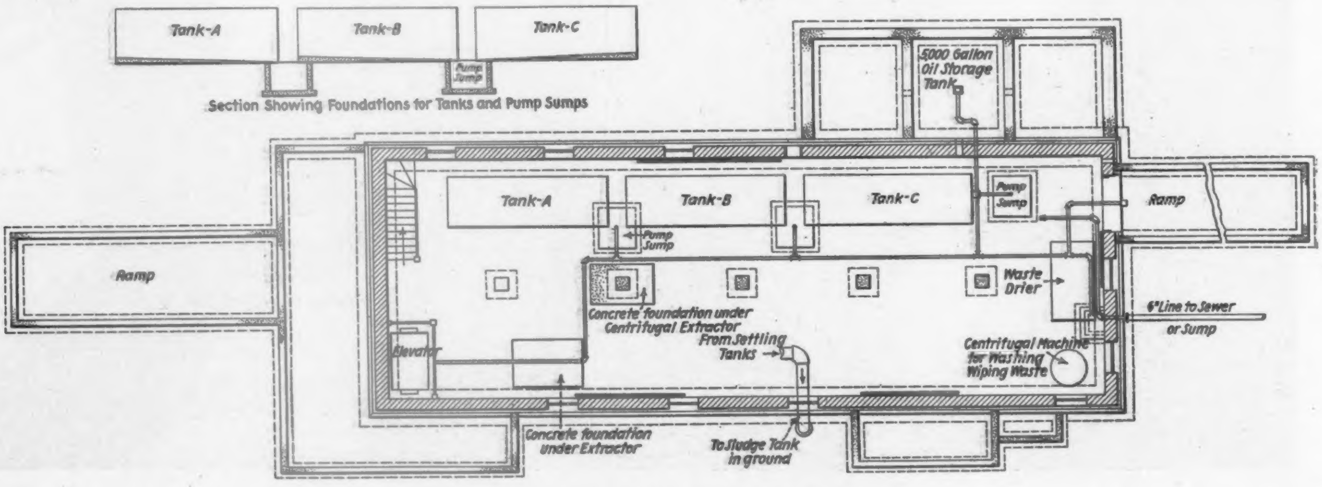
It is then carried by the overhead crane back to the extractor a second time and the cleaning process is repeated for a period of 12 min. By reasons of the fluffy condition of the waste it is now more susceptible to the cleaning action of the hot oil flowing through it than during the first treatment in the centrifugal extractor.

The basket is next removed and submerged in one of the six saturating tanks containing reconditioned or new oil. Here the waste is allowed to remain for a period of about two hours at a high temperature to evaporate any moisture and to insure thorough saturation. The next step is to convey the waste-laden basket to the extractor where it is rotated slowly from 30 sec. to 1 min., until the oil content in the waste is of the proper proportion. The finished product is placed in containers, weighed, and is then ready for shipment.

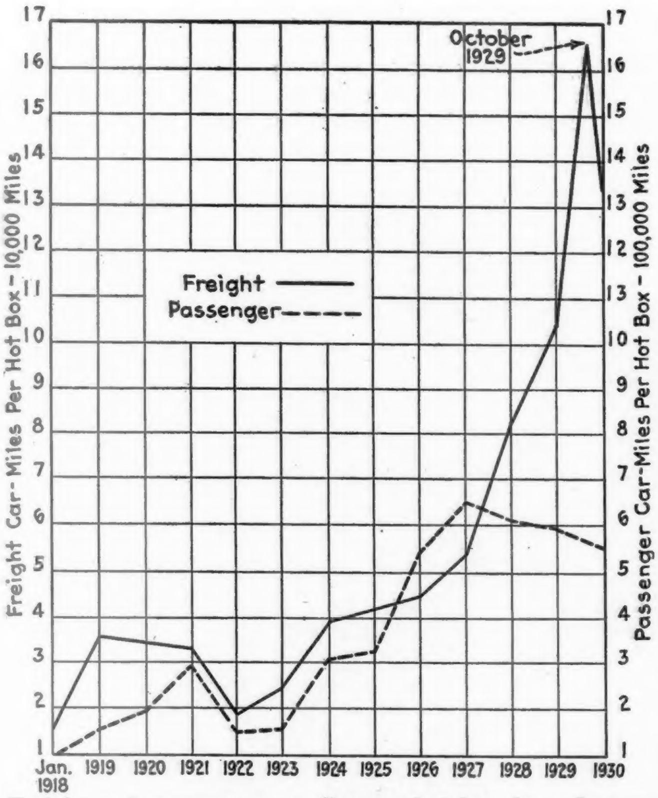
As the layout suggests, the operation is continuous, one basket of packing following another through the various mechanical steps without interruption, thus insuring capacity production with reasonable promptness and at a minimum cost.

Renovating the Oil

The oil extracted from the packing in the centrifugal extractor flows through a drain pipe into tank *A* in the basement. The piping in the plant is so arranged that all dirty oil in the oil and waste reclamation processes



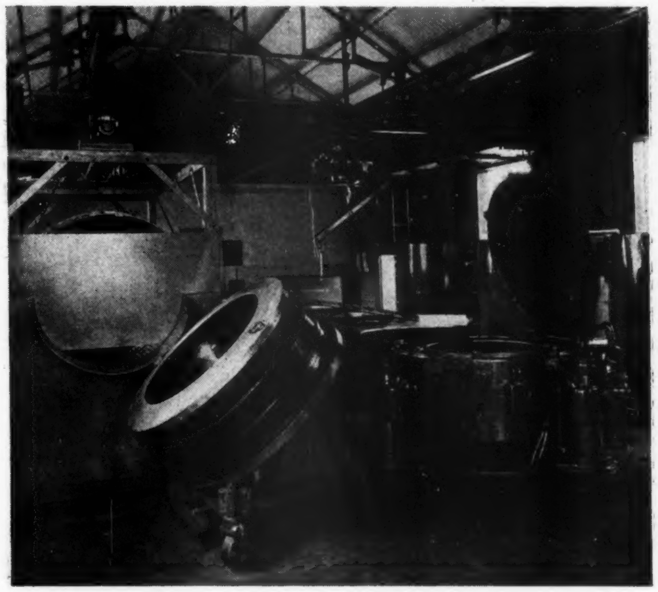
Plan of the equipment located in the basement



Freight and passenger car-miles per hot box from January 1, 1918 to 1930, inclusive

flows to this tank. The oil in tank *A* is heated to cause it to flow more readily, after which it is delivered, by means of an electrically driven centrifugal pump, to the clarifier, which is located on the main floor of the building. This oil is fed to the clarifier near the bottom of the tank while the machine is operating at full speed. The sludge or sediment that remains at the end of this clarifying process is removed from the clarifier and used for lubricating switches, painting angle bars, greasing center plates and various other purposes.

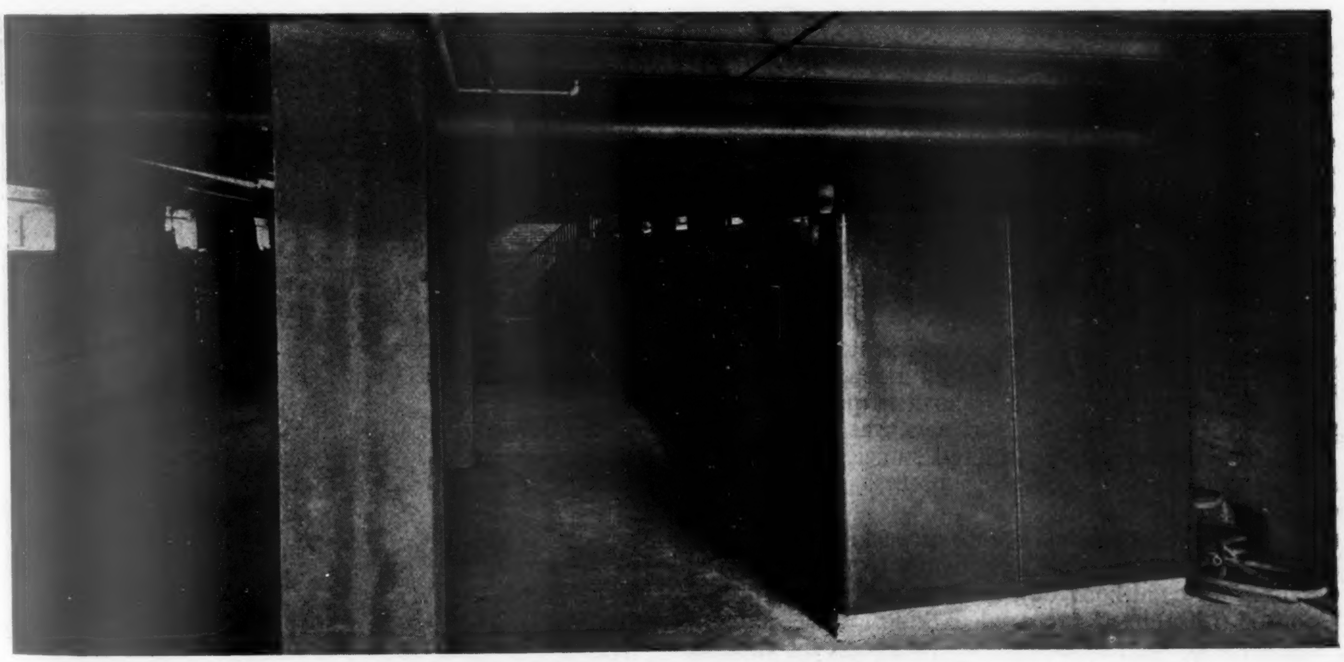
The renovated oil is delivered by the centrifugal clarifier to tanks *B* and *C* in the basement. Here some of the renovated oil is by-passed for the treatment of waste as has been previously described. The renovated oil remaining, after further heat treatment in these tanks to remove accumulated moisture, is delivered to the three large settling tanks on the first floor, where it is allowed to settle. A chemical solution, from tanks overhead, is sprayed on the surface of the oil to hasten the precipitation of foreign substances. The depth of good oil is determined by immersing a strip of clear glass after which the reconditioned oil is decanted



Basket in position for loading into the tumbler—Hard lumps and rolls must be broken up in order to get them through the opening at the bottom of the shield

by means of a collapsible pipe in each tank and delivered to the main storage tank which also contains new oil as received from the refinery.

It will be noted that mention is made of renovated and reconditioned oils and, since the use of these terms may be confusing, each should be clearly defined. When the oil leaves the clarifier it is designated as



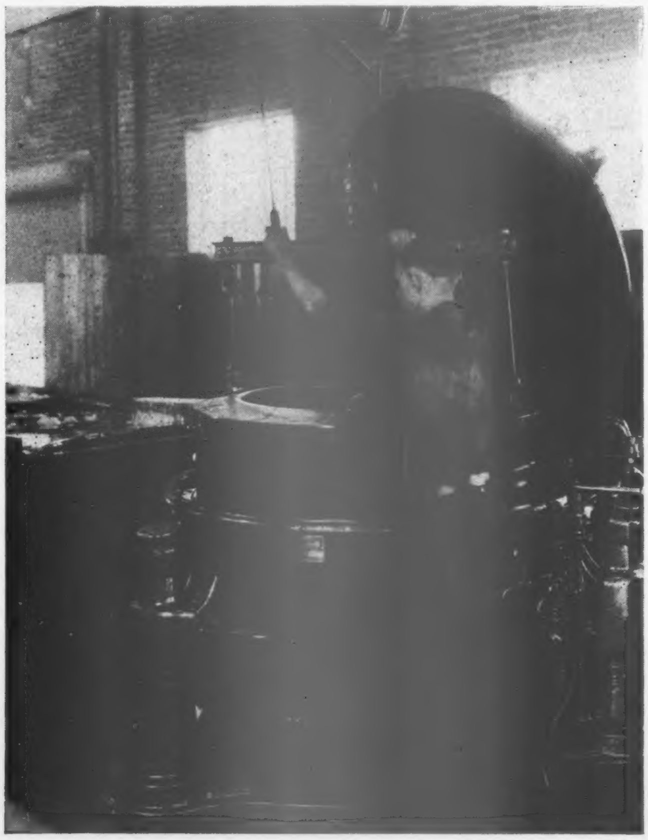
The basement—Tank *C* is shown in the right foreground

"renovated oil." Only renovated oil is used in the process of renovating waste. This renovated oil is pumped from tanks *B* and *C* to the three settling tanks for further treatment after the completion of which it is designated as "reconditioned oil."

The following is a typical analysis of the reconditioned oil that is now being produced by the new plant:

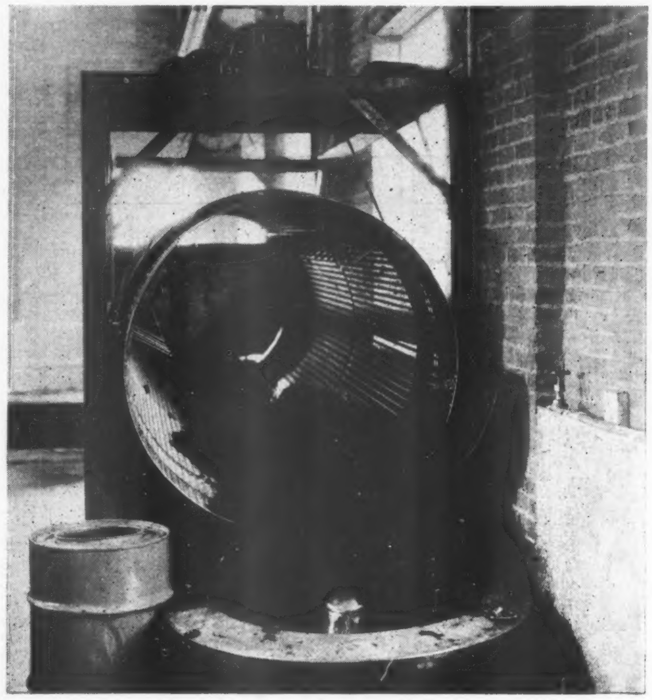
Flash	350 deg. F.
Fire	400 deg. F.
Pour:	
High	35 deg. F.
Low	Zero
Viscosity at 130 deg. F.	195 sec.
Viscosity at 210 deg. F.	59 sec.
Precipitation number	.1
Moisture, per cent	.05

A force consisting of three men, paid on a piecework basis, and one supervisor, can produce approximately 6,500 lb. of prepared packing and 700 back-end rolls in an eight-hour day. One man operates the roll-making machine and performs various odd jobs around the plant as occasion requires. The roll-making machine was developed in the experimental plant. It is motor driven and is controlled by a foot treadle. The core of the roll is made of renovated packing and the outside of the roll is made of new waste. This addition of new waste is considered sufficient to make up any losses in the renovating process during normal operating conditions.



Removing a basket from the extractor—The timing device by which the operation of the machine is controlled is shown in the lower right-hand corner of the illustration

Estimated on a basis of 9 lb. of packing to a journal box, the plant must produce slightly over 700 back-end rolls in an eight-hour day to be in line with a production of 6,500 lb. of prepared packing. Each container holds an average of 230 lb. of packing, and each extractor basket can hold the contents of two containers, making a total of about 460 lb. for each charge in the extractor. The operation of the extractor, of course, is the determining factor in the production of the plant. Twelve baskets are in constant circulation between the extractor, tumbler, roll-making machine and the six saturating tanks. The equipment used in each operation comprising the renovating process has been carefully balanced as to production, capacity, and handling of materials.

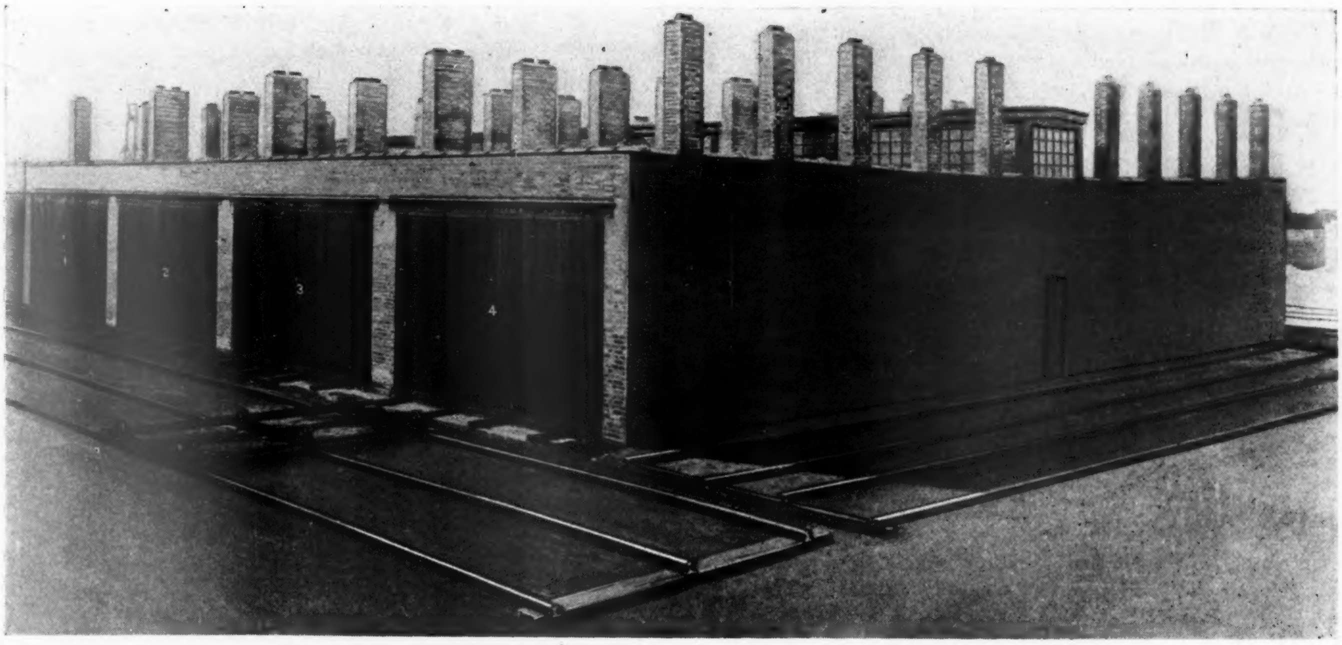


The interior of the tumbler

A system of distribution has been arranged whereby the stations to be supplied are divided into zones. By

(Concluded on page 207)

Making back-end rolls at Oneonta



Type of dry kiln installed at the Angus shops of the Canadian Pacific

Seasoning Wood at the Angus Shops of the C. P.

Dry kiln of improved design produces seasoned lumber of uniform quality

SEVERAL years ago the Canadian Pacific installed a lumber dry kiln at its Angus shops, Montreal, Que., for operation in connection with its planing mill and cabinet shop. The new kiln installation has a drying capacity of 240,000 board feet, and is located adjacent to the planing mill and next to a kiln of an old design. It was designed by the Curtis-Hosey Dryer Company, 32 Thirty-third street, Brooklyn, N. Y., and consists of eight kilns, four on each side, with a capacity per kiln of 30,000 board feet.

The wood mill at Angus produces practically all of the finished lumber used on the Eastern Lines of the Canadian Pacific. From 15 to 17 million board feet a a year go through the Angus shops alone. For a number of years the lumber was dried in a kiln heated with a dry heat which caused the interior moisture to seek the surface. This dry, hot atmosphere tended to produce surface checks, and considerable loss was sustained due to shrinkage and warpage.

The moisture in green lumber amounts to from one-third to one-half its total weight. All of this moisture must be expelled before the lumber is dry. This cannot be done simply by drying the materials, and it was found from experience with the old kiln at Angus that any means employed for accelerating the process often produced complications which were ruinous to the wood, such as splitting, checking or warping; or caused some other defect which made the lumber worthless. Drying lumber in the open air requires many months and entails keeping a large supply in storage. The new kiln is designed to provide temperature and moisture control so that the flow of the interior moisture to the surface is in satisfactory adjustment with the surface evaporation. It provides a natural vertical air movement, without the use of fans or condensing coils, and secures uniform drying in a few days.

The Lumber Dry Kiln at the Angus Shops

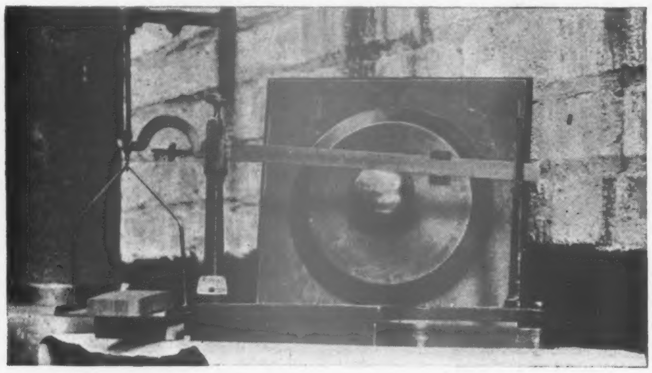
The lumber kiln installed at Angus is known as the pocket type and is built for endwise piling. It is of brick construction and the roof insulated with cork. The doors are of a special asbestos and wood construction. The dryer equipment includes systems for ventilating, heating and humidifying, the latter two of which are automatically controlled.

The ventilating is not automatic as far as control of openings is concerned, though it could have been fitted up with such control had it been thought desirable. The system as installed provides a natural vertical air movement through the lumber without the use of fans or condensing coils and secures drying in a few days. Ad-

justments of the automatic regulating equipment vary according to the kind of lumber going through the kiln. The greenness of the lumber is also a factor that has to be taken into account.

Ventilation and Automatic Control Equipment

Heat for each kiln compartment is provided by steam radiators placed directly beneath the piles of lumber.



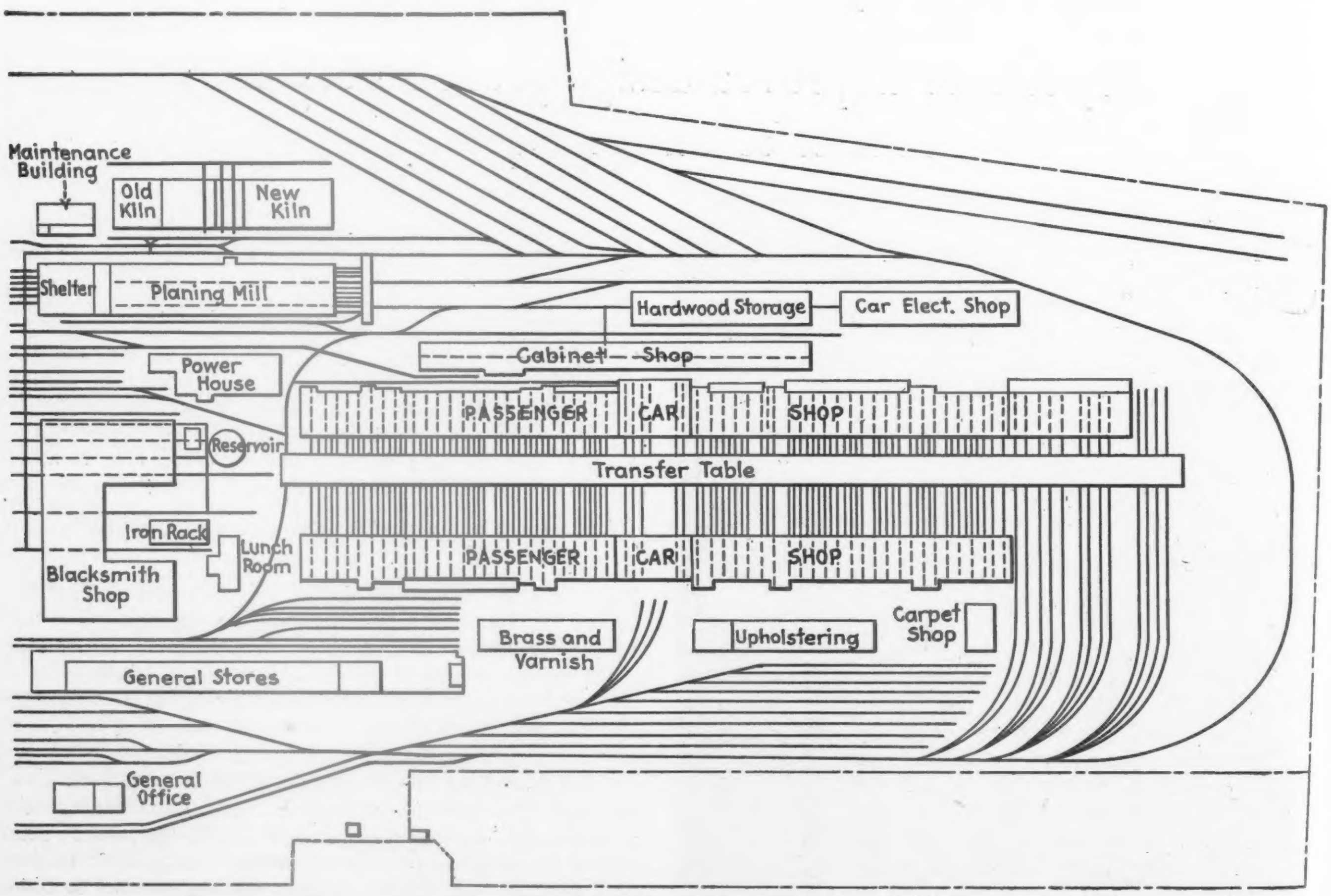
Scale and circular slide rule used by the kiln operator for determining moisture content

The heating chamber is closed on all four sides, baffle plates being provided at the sides extending up nearly to the lumber so as to confine all radiated heat entirely below the lumber to be dried. The fresh air supply enters horizontal ducts which extend through the side walls of the heating chambers, a sufficient number of ducts being installed to provide even distribution of air underneath the entire heating system. The heated air rises up through the lumber which is carefully piled on trucks. Stickers of uniform dimensions are placed directly above each other between the layers of boards, spaces being left between the edges of the various pieces, and a funnel shaped opening being provided in the center of

Control room of the dry kiln—Humidity recording instrument is shown secured to the wall in the right foreground

the cross-section of the load so that heat as it rises spreads out between the various layers of boards in the pile and thus tends to pass between each individual board.

The air is cooled by the evaporation of the moisture from the lumber, and passes down the walls and out through wall registers that connect with vertical wall



Layout of the car shop and wood mill buildings showing the location of the new dry kiln

flues which extend well above the roof. All registers are operated directly from the control room and there is no necessity on the part of the operator to enter the kiln at any time during the process of drying.

The air in the kiln is humidified by steam which is discharged through a system of perforated pipes in the heating chamber. The spray units are designed to provide a uniform and even volume of vapor at all points below the lumber piles. They are connected to the supply lines at 45-deg. angles so as not to retard the flow of steam when entering the spray heads. The pipes of the spray units are installed so that any condensation flows directly to an automatic trap. This prevents the spray heads filling with condensation and making them inoperative or causing them to discharge water instead of vapor.

Continuous recording instruments are provided for recording the temperature and humidity of each compartment for each charge of lumber. The temperature recording apparatus controls the amount of steam which enters the heating units. The correct temperature for various kinds of lumber is shown on a chart which guides the operator in setting the temperature control mechanism. A rise in temperature above the point for which the instrument has been set by the operator automatically reduces the opening of the steam valve. Conversely, if the temperature drops below the setting point the controller opens the steam valve wider.

The relative humidity is controlled automatically by regulating the volume of the steam spray by means of a wet-and-dry-bulb temperature control. The automatic humidity control consists of two separate control systems, one of which starts at the dry bulb and ends in the steam-heating valve, while the other starts at the wet bulb and ends at the spray control valve. Therefore, the control of relative humidity within the kiln is simply the control of the wet-bulb temperature in relation to that of the dry-bulb temperature.

This system of humidity control is what is generally known as oscillating control in which the spray is fully on or is entirely shut off. An electric contact device is used to control the wet-bulb temperature. Instead of one setting point, the operator must adjust two setting points which causes the relative humidity to oscillate between any upper and lower limits desired.

As it requires considerable power to operate the

RECORD NO. 256
BEGINNING 5/6 MATERIAL B.C. Fir KILN NO. 3
ENDING 5/13 SIZE 2"x6"x18 ft. 30,000 ft.

DATE	DAYS IN KILN	CONDITION	TEMP. DRY BULB	TEMP. WET BULB MAX.	TEMP. WET BULB MIN.	HUMIDITY MAX.	HUMIDITY MIN.	DAMPERS	REMARKS
5		42.%	150	147	130	94.%	58.%	Open 1/4	
6	1								
7	2		160	152	134	80.%	50.%	"	
8	3								
9	4		170	158	140	73.%	45.%	1/2	
10	5								
11	6		180	162	140	65.%	35.%	"	
12	7								
13	8	6.1%	Final	Kiln	test				
	9								
	10								
	11								
	12								
	13								
	14								
	15								
	16								
	17								

Fig. 1

RECORD NO. 61
BEGINNING 6/26 MATERIAL B.C. Fir-Spruce KILN NO. 2
ENDING 7/3 SIZE 2x6" J.E.L. 16-18-22 ft. 2x6"-8"-10" Decking 9'-10' ft.

DATE	DAYS IN KILN	CONDITION	TEMP. DRY BULB	TEMP. WET BULB MAX.	TEMP. WET BULB MIN.	HUMIDITY MAX.	HUMIDITY MIN.	DAMPERS	REMARKS
26		Average	160	160	135	100.%	52.%	Closed	for P.S.
27	1	30%							
28	2		165	160	135	88.%	45.%	1/4 open	
29	3								
30	4		170	160	135	77.%	39.%		
1	5								
2	6	Kiln	180	160	135	62.%	30.%		
3	7	Test							
	8	8.6%							
	9								
	10								
	11								
	12								
	13								
	14								
	15								
	16								
	17								

Fig. 2

RECORD NO. 666
BEGINNING April 9 MATERIAL B.C. Fir KILN NO. 6
ENDING " 22 SIZE 2 in. to 2½ in.

DATE	DAYS IN KILN	CONDITION	TEMP. DRY BULB	TEMP. WET BULB MAX.	TEMP. WET BULB MIN.	HUMIDITY MAX.	HUMIDITY MIN.	DAMPERS	REMARKS
9		Mah 42%	150	150	130	100.%	58.%	Closed	
10	1								
11 S	2								
12	3		160	155	132	88.%	46.%	1/2	Opened dampers ½ after P.S.P.
13	4								
14	5								
15	6								
16	7		170	160	138	77.%	44.%		
17 S	8								
18	9								
19	10								
20	11		180	164	140	68.%	35.%		
21	12								
22	13	Mah 5.2%							
23	14								
24 S	15								
	16								
	17								

Fig. 3

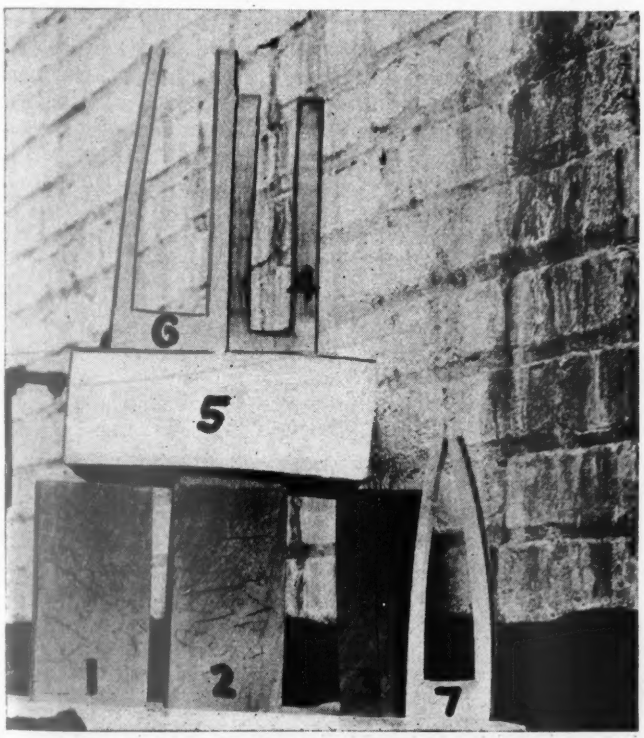


Fig. 4—Tests of Sitka spruce, mahogany, ash and white pine

RECORD NO. 429
BEGINNING 2/2/29 MATERIAL Sitka Spruce KILN NO. 1
ENDING SIZE 4"x4" to 22" (2 P.M.)

DATE	DAYS IN KILN	CONDITION	TEMP. DRY BULB	TEMP. WET BULB MAX.	TEMP. WET BULB MIN.	HUMIDITY MAX.	HUMIDITY MIN.	DAMPERS Closed	REMARKS
		39%	Sprayed to	148 Wet	bulb	no heat			
2	1		140	138	122	98.%	60.%	1/4	Open
3	2								
4	3		150	147	128	93.%	55.%	"	"
5	4								
6	5		155	150	130	88.%	50.%	"	"
7	6								
8	7		155	150	130	88.%	50.%	1/2	"
9	8								
10	9		160	150	130	78.%	43.%	"	"
11	10								
12	11								
13	12								
14	13								
15	14	12.%							
	15								
	16								
	17								

Fig. 5—Report of dry conditions for the Sitka spruce shown in Fig. 4

valves of both steam systems, the electric control instruments simply operate small air valves, air pressure being provided by a small compressor unit operating automatically, so that no hard work is done by the control instruments, themselves, but by the air.

Method of Operation

A sample piece, 4 ft. in length, is obtained from each charge of lumber at the time it is placed in the kiln. This sample is placed in the kiln near what is called the sample door, which opens into the control room. This door is 12 in. by 14 in. and is provided with glass to enable the operator to observe the drying process from time to time. The ends of the first two loads placed in the kiln are carefully watched during the operation. The sample piece, which has been carefully selected from the stock going into the kiln, is weighed and measured in order to ascertain the condition of the charge with respect to moisture content and shrinkage before it is placed in the kiln, sections about 3/16 in. thick being cut for the purpose and dried in an electric oven until they cease to lose weight, care being taken to see that the wood is not charred during the drying. From the two weights the moisture content is worked out. The data obtained from the sample determine the drying schedule which is entered on a record sheet.

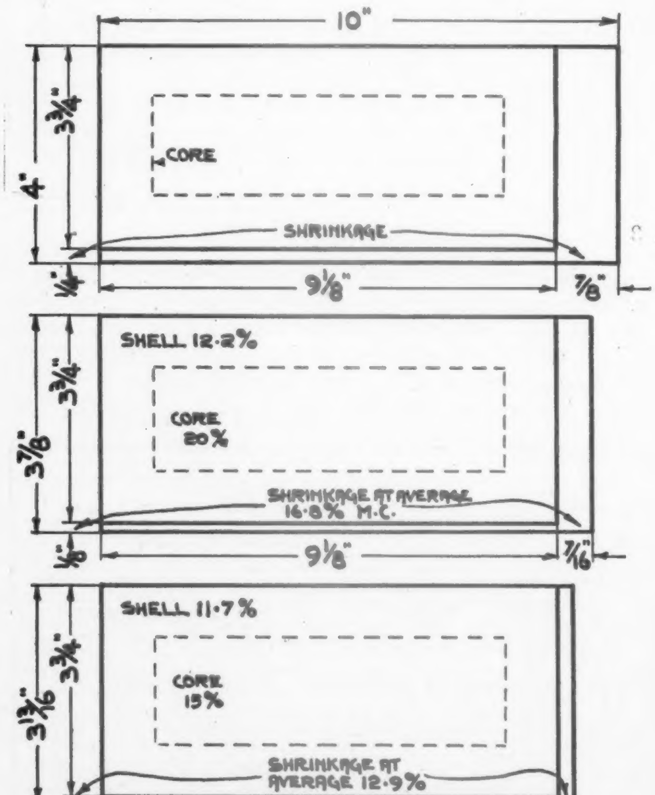


Fig. 6—Sketch showing observations made by the kiln operator during the drying time of the Sitka spruce shown in Fig. 4

Top—This sample was placed in the kiln with a moisture content of 36 per cent. Oven drying caused a shrinkage of ⅞ in. in 10 in. Center—The same sample after being in the kiln for 8 days. Bottom—Condition of the test board after 15 days in the kiln.

The regulating instruments are set accordingly and are changed every few days or as the condition of the sample as to checking, warping, honeycombing, casehardening, or the saving of drying time warrants making a change, it being found that as the moisture becomes less in the lumber, a higher drying temperature and a lower relative humidity can be used without causing trouble. The condition of the sample piece or the purpose for which the lumber is to be used often results in the changing of a drying schedule after it has been drawn up. The appearance of the ends of the first two loads placed in the kiln also assists the operator in the adjustment of his instruments.

The selection of a schedule is governed by the different species of wood, thickness and moisture content.

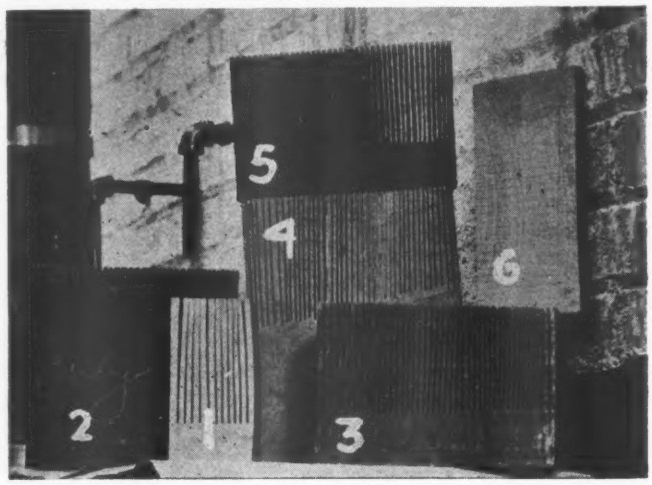


Fig. 7—Sample stock cut to determine the effect of moisture content

It is often necessary, upon testing air-dried stock, to equalize it with moisture to a depth depending on the thickness and the nature of the wood before drying takes place, which will eliminate the possibility of casehardening. This process is called the preliminary spray period.

This period is followed by a drying period to afford a transfusion of moisture from the core of each piece of lumber through the shell to the surface. During the drying period the humidity conditions of the kiln drop from the maximum setting point on the control instrument to the minimum setting point. This automatically opens the spray controller and another spray

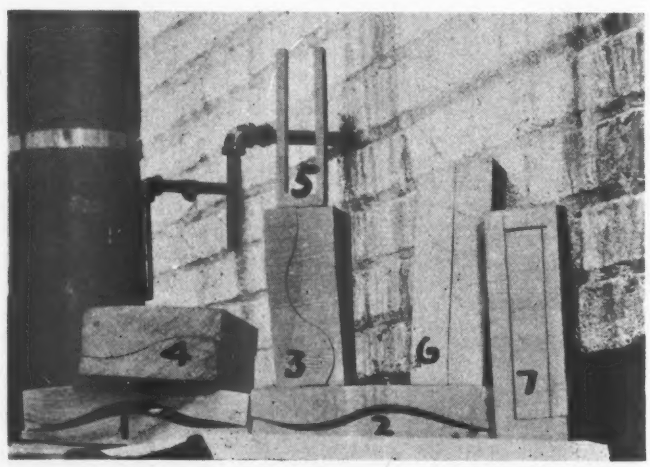


Fig. 8—Tests for casehardening; core and shell thickness

period takes place which is followed by another drying transfusion. This operation continues until the end of

the drying operation, with shorter spray periods occurring toward the end of the time, as shown on the charts.

Fig. 1 shows the set-up for 2-in. by 6-in. by 18-ft. British Columbia fir, flat grain, which was reduced from an original moisture content of 42 per cent to 6.1 per cent in a period of eight days. It will be noted that the temperature of the dry bulb was at first set at 150 deg. F. and that it was stepped up 10 deg. F. every two days until a final temperature of 180 deg. F. was reached. The high and low humidities as indicated by the temperatures of the wet bulb were at first 94 per cent and 58 per cent respectively, while at the end of the drying period the high and low humidity per cents were 65 per cent and 35 per cent, respectively. The difference in the initial and final humidity percentages does not represent that much reduction in the actual moisture content of the air, as the higher the temperature the more moisture air will carry in suspension.

Fig. 2 shows the drying schedule for a mixed charge of 2-in. by 6-in., by 16-, 18- and 22-ft. British Columbia fir and 2-in. by 6-in., 8-in. and 10-in. wide spruce decking 9-ft. 10-in. long. This charge was subjected to a preliminiary spray period and the dry bulb temperatures and the humidities varied considerably at different periods of the drying. The drying period was made comparatively long to take care of any pieces containing more than the average moisture content (30 per cent) of which there was considerable in the charge. Under such conditions, the schedule has to be made up to take care of the maximum moisture content of any of the charge. Fig. 3 shows the actual condition of the kiln of the drying time for 2-in. mahogany varying in width from 6 in. to 16 in., and 2½-in. British Colombia fir having a width of from 6 in. to 12 in. This stock was treated as green lumber because of the width variation in its moisture content. Some of the mahogany originally had a moisture content of 42 per cent which was dried to 5.2 per cent in 13 days.

Fig. 4 shows two test pieces cut from 4-in. by 6-in. Sitka spruce which was kiln dried especially for aircraft construction. These two samples, marked No. 1 and No. 2 in the illustration, show the comparative results to be expected between proper kiln-drying methods and atmospheric seasoning. Piece No. 1 was seasoned in the kiln, while piece No. 2, cut from the same board as piece No. 1, was dried outside under atmospheric conditions. Horizontal cracks in piece No. 2 are shown clearly in the photograph, although it was only a small sample 9 in. in length. Pieces No. 3 and No. 4 show the results of a casehardening test of a sample cut from a 3-in. mahogany board. Pieces No. 5 and 6 are samples cut from a 4-in. ash board which has been slightly casehardened. Note the perceptible drawing-in of the prongs. Piece No. 7 is a test piece of 3-in. white pine taken from air-dried stock. Note how much drier the original outside has been as compared with the inside as shown by the two points of the prongs nearly touching.

Fig. 5 shows the humidity, heat and schedule for the actual drying conditions, time and final moisture content of piece No. 1, shown in Fig. 4. The sketches in Fig. 6 show the observations made by the operator during the drying time for piece No. 1, Fig. 4, and show the shrinkage, shell and core tests of the Sitka spruce to an oven-dried condition. The top sketch shows a cross-section of the timber as received 4-in. thick by 10-in. wide and containing 39 per cent of moisture, also the shrinkage of the thickness (¼-in.) and of the width (⅞-in.) after a small cross-section had been made bone-dry in an electric oven. The size 3¾-in. by 9⅛-in. represents its final cross-section after this drying. The center sketch shows that after the lumber had been in the kiln for eight days its cross-section was only 3⅞-in. by 9$\frac{3}{16}$-in. and that the average moisture content at that time was 16.8 per cent though the shell only contained 12.2 per cent of moisture and the core 20 per cent. On drying a small section in the oven it shrank a further ⅛-in. in thickness and a further $\frac{7}{16}$-in. in width, leaving the final bone dry dimensions the same as for the first piece tested; namely, 3¾-in. by 9⅛-in. The bottom sketch shows the same information as given above, after the material had been in the kiln for 12 days, at which time its dimensions before drying in the electric oven were 3$\frac{13}{16}$-in. thick by 9⅜-in. wide, the average moisture content being 12.9 per cent, the shell containing 11.7 per cent and the core 15 per cent. A comparison of the shell and core moisture contents shown in the second and third diagrams indicates that little surface drying took place from the eighth day to the twelfth, but there was a decrease of 5 per cent in the core moisture content. The remaining drying time of two days was used to equalize the stock to the required moisture content of 12 per cent.

Fig. 7 shows the manner in which samples are cut to determine the moisture content. The stock from which these samples were cut varied in thickness from 3 in. to 6 in. Piece No. 1 in the photograph was cut from 3-in. birch before being placed in the kiln. It had already dried a considerable time in the air before this sample was cut. Note how the thin strips, which are from ⅛-in. to $\frac{3}{16}$-in. thick, have warped due to the lack of uniformity in the moisture content. Pieces 2, 3, 4 and 5 are samples of ash taken from different charges which were re-sawn from final kiln test pieces while hot. The straightness of the thin strips sawn in the block indicates a uniform moisture content. Piece No. 6 in the illustration shows the end grain of piece No. 4.

Method of Cutting Test Pieces

The method of cutting test pieces for determining casehardening, and for core and shell tests are shown in Fig. 8. Pieces 1 to 4, inclusive, were cut from 2-in. and 2½-in. birch. No. 1 and No. 2 were cut from the sample piece at different times during the drying period. Note the difference in casehardening between the piece which was cut early in the drying period, and piece No. 2 which was cut several days later. Warping increases with the increase in casehardening. No. 3 and No. 4 are samples cut after the final kiln test. These pieces were cut from the center of the charge, re-sawn and cut for casehardening while hot. Note the absence of warping. Piece No. 5 was cut from 3-in. by 6-in. birch after the final kiln test to determine the presence of casehardening. This piece shows another method of cutting to determine the presence of casehardening. Had there been any, it would have been shown by the considerable drawing together of the two prongs. No. 6 and No. 7 were cut from 4-in. by 9-in. ash for core and shell tests. These test pieces show that this ash is in good kiln-dried condition.

The following varieties of lumber have been dried in this kiln since its installation with satisfactory results: Oak, ash, mahogany, birch, maple, walnut, chestnut, white pine, white wood, spruce, British Columbia fir, cherry, gumwood, hemlock, larch, basswood, poplar and red pine. Approximately 3,432,000 board feet ranging from 3/16 in. to 4 in. in thickness and from 3 in. to 24 in width has been handled through this kiln within a period of six months.

Selection of Apprentices for the Railway Shop

By Laurence Parker
Kansas State Board for Vocational Education

APPRENTICES who later become executives is the dream of every apprentice supervisor who takes his job seriously. He wants every apprentice to be so well trained, of course, that his company will hire him as a journeyman. But in just a few years time he hopes to see this man made a foreman and later a general foreman.

To give any assurance whatever of such a dream coming true, proper selection of boys as apprentices is absolutely necessary. Too often in the past selection has been made on the basis of friendship between the boy's father and some foreman. Often the boy has been selected because his father, while living, was employed by the company. With such haphazard selection as this there is grave danger that an attempt may be made to "make a silk purse from a sow's ear."

The purpose of this article is to describe certain experiments made in using tests as a basis of selection of railway shop apprentices.

T. C. Gray, formerly supervisor of apprentices for the Missouri-Kansas-Texas, in June, 1926, enlisted the aid of the author in this problem. He stated that inspection of applicants, the information on the usual application form, school records (when obtainable) and grade reached in school, were not reliable enough criteria to predict success.

Through the cooperation of Kansas State Teachers College, Pittsburg, Kans., the tests were furnished and scored. The author gave the tests to 63 apprentices in service at Parsons, Kansas. The following tests were given.

Otis Group Intelligence Scale (Advanced examination).

Thurston Vocational Guidance Tests (Technical information test).

Stenquist Mechanical Aptitude Tests.

All of these tests are published by The World Book Company, Chicago.

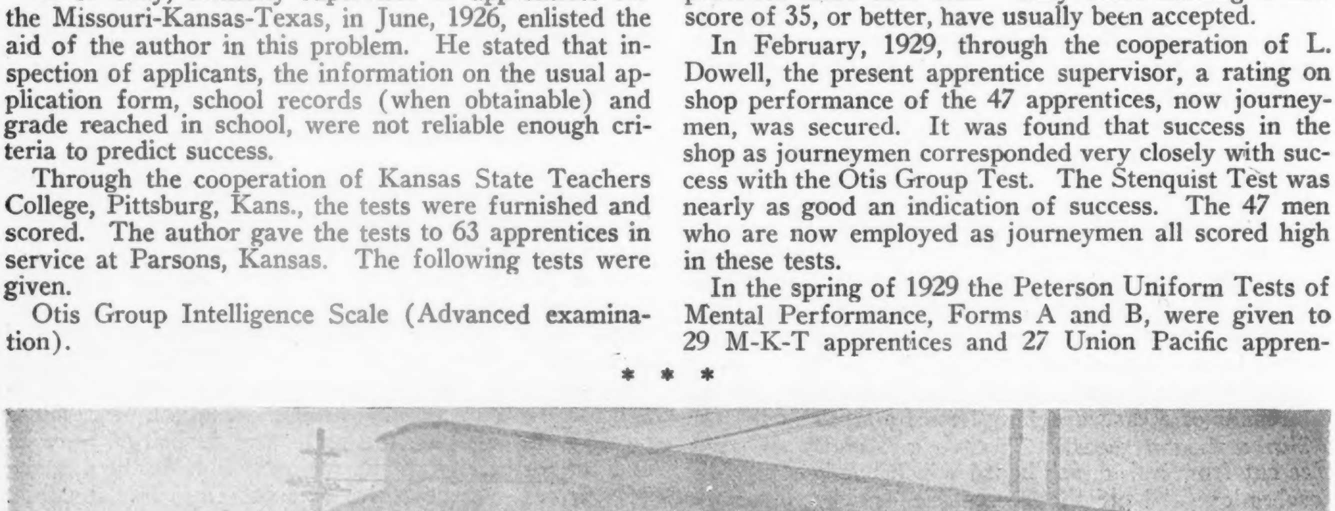
Before the tests were scored, Mr. Gray and his assistants rated on the scale of 100 the accomplishment of the apprentices over the previous 12 months. This was a combined grade covering both shop work and the related instruction given in the apprentice school. Mr. Gray worked up the scores of the tests graphically and compared results with his rating of the men. Upon the basis of his graph, he concluded that the Otis Group Test gave the best indication of successful shop and school work. The Stenquist seemed next best, while Thurston Test ranked third.

The self-administering form of the Otis Test, believed to be the more convenient to give, has been used as a rough elimination screen in the selection of apprentices since that time. Only those making a raw score of 35, or better, have usually been accepted.

In February, 1929, through the cooperation of L. Dowell, the present apprentice supervisor, a rating on shop performance of the 47 apprentices, now journeymen, was secured. It was found that success in the shop as journeymen corresponded very closely with success with the Otis Group Test. The Stenquist Test was nearly as good an indication of success. The 47 men who are now employed as journeymen all scored high in these tests.

In the spring of 1929 the Peterson Uniform Tests of Mental Performance, Forms A and B, were given to 29 M-K-T apprentices and 27 Union Pacific appren-

* * *



Union Pacific wreck crane built by the Bucyrus-Erie Company and designed to lift a maximum load of 200 tons at 17½ ft.—The auxiliary hook has a maximum capacity of 60 tons at 30 ft. and 45 tons at 48 ft.—Weight, 375,000 lb.

tices. These tests, which involve only simple arithmetic work, attracted us as being simple to give. They are published by Dr. J. C. Peterson, K. S. A. C., Manhattan, Kansas. It was found that these tests also very closely corresponded with grades given the apprentice in shop work.

It is still too early in the experiment of using tests to select apprentices to make any very positive statements. There are many more tests we would like to see given, not only to the small groups so far used but to large apprentice groups throughout the country.

Such experiments on a large scale will take considerable time, five years probably. The expense will not be great, but the labor involved in a statistical analysis of results means real labor on the part of experts in that line.

If all this is made possible we are sure that the selection of superior apprentices by means of tests will become a routine matter.

Missouri Pacific Shop-Standards Plan

(Continued from page 183)

number of times each listed operation was performed, and delivered to the next department during the day. These tally sheets are turned in to the production supervisor each night. He rates, extends and totals the value of the output of each department, in standard man-hours. The production supervisor also is furnished with a record of the total payroll man-hours charged to each department for the day. Then the value of standard man-hours representing the output, divided by the total payroll man-hours, furnishes the operating ratio upon which the standard rating for each department is based.

Work Not Credited Until Completed

A further important factor around which this plan centers is the fact that no department is given credit for work going through that particular department until the unit has been forwarded to the next department. In other words, credit for completed units only is allowed, which tends to keep work moving. Because departmental results are measured in standard units, it is to the advantage of each supervisor to show as high a credit as possible. Consequently, the work is brought into production as soon as it reaches each department. Finished work does not remain long in the department when the work is completed, because dormant material means, in the final analysis, the lowering of departmental rating and it is only human for both men and supervision to exert every possible effort to prevent a decline of their department's rating.

Proper routing prepares the way for operations, as completed by the previous group of workmen. Time loss between jobs is reduced to a minimum, and the material and parts necessary for repairs are on hand in proper sequence when needed. Thus the setting of time for the completion of each job serves as a goal, which, if fairly established, still further expedites production. Master charts, graph portrayals and departmental charts are maintained to show the progress being made in each department from day to day. They also serve to show where progress is being made, together with a fore-warning, visualizing anticipated delays or failure to meet schedule. Through this medium the supervisor is constantly kept informed regarding the exact condition of his department and can immediately apply the remedy by being able to place his finger upon any departmental deficiency. His incentive to increase his departmental rating is impelled further through the fact that the condition in his department as well as others, displayed by a graphic chart, Fig. 4, is posted conspicuously in the shop proper.

Statement Showing Average Days in Shops for Locomotives Receiving Class 1, 2 and 3 Repairs

	Sedalia				Little Rock				All Shops
	1	2	3	Ave.	1	2	3	Ave.	Ave.
Year 1925	58.0	51.3	32.8	42.6	62.2	55.8	35.1	44.5	40.7
Year 1926	65.8	68.1	35.2	43.4	52.0	47.0	31.1	36.6	39.2
Year 1927	72.6	56.2	50.7	37.1	45.6	45.2	33.2	34.6	34.1
Year 1928	37.5	46.7	25.5	29.1	30.3	38.8	28.1	29.2	28.2
Year 1929	28.3	43.0	22.5	25.1	27.4	33.4	25.0	25.4	25.7

Friendly Inter-Shop Competition Stimulated

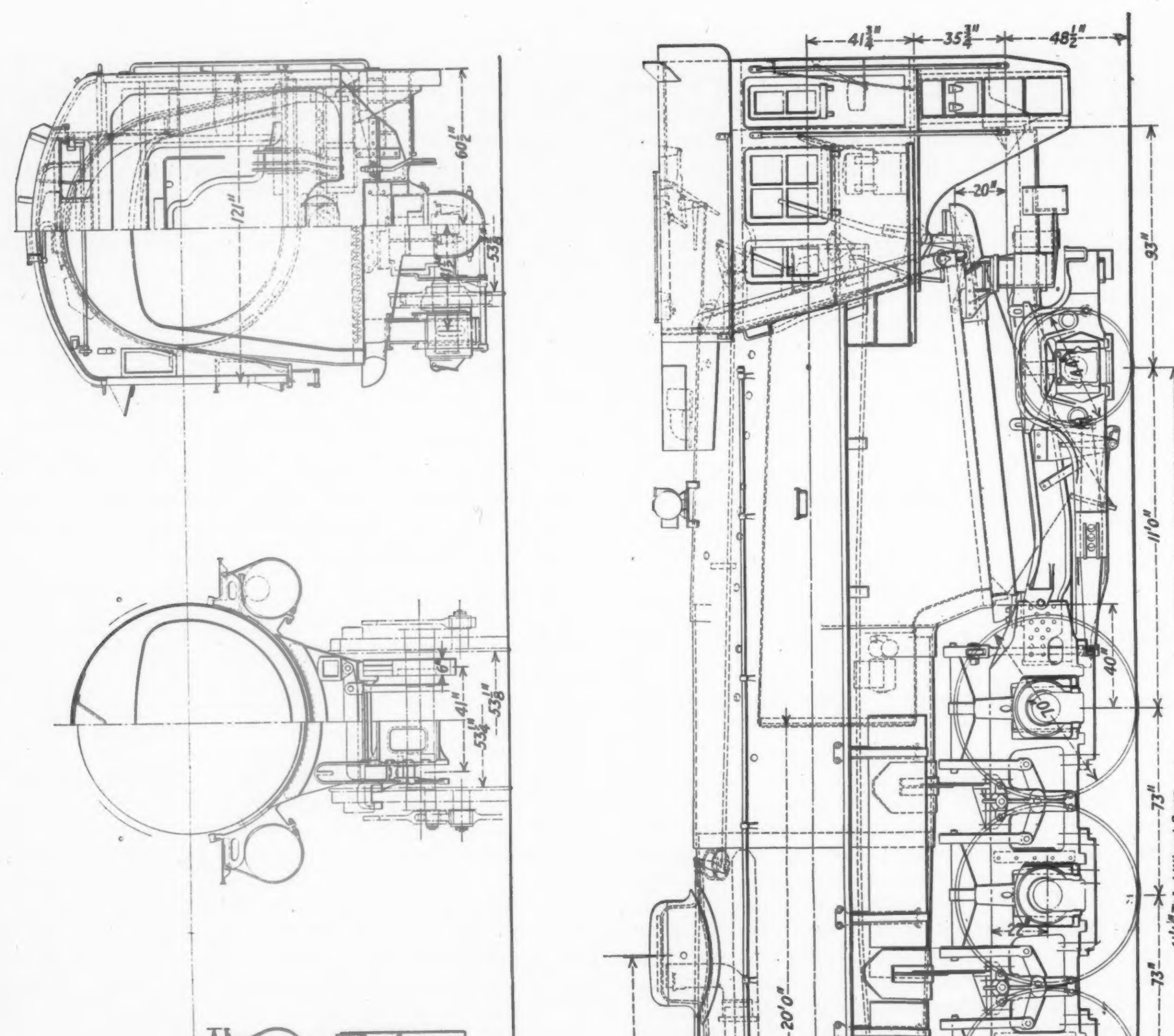
Friendly competition between the two larger shops is constantly visualized to supervision through a comparative graphic portrayal of locomotive output, average man-hours charged per locomotive and the efficiency of rating of each shop, Exhibit A, all based upon schedules of a common standard.

One factor clearly developed by the shop-standards plan has been the relation between locomotive input and output. In other words, in order to secure a uniform, high output, power must be lined up and assigned for shopping on a corresponding basis. The average elapsed time between locomotives assigned to the shop at Sedalia, for example, during the 12 months of 1929 was one locomotive in shop every 10.4 hours, while the output averaged one completed every 10.2 hours. At Little Rock, one locomotive was assigned to the shop every 10.4 hours, while the average elapsed time between completed locomotives ready for service amounted to 9.9 hours. During September and October, one locomotive was completed practically every 8 hours at Sedalia, while at Little Rock, during the months of September and November, the output was exactly one locomotive per 8-hour shift.

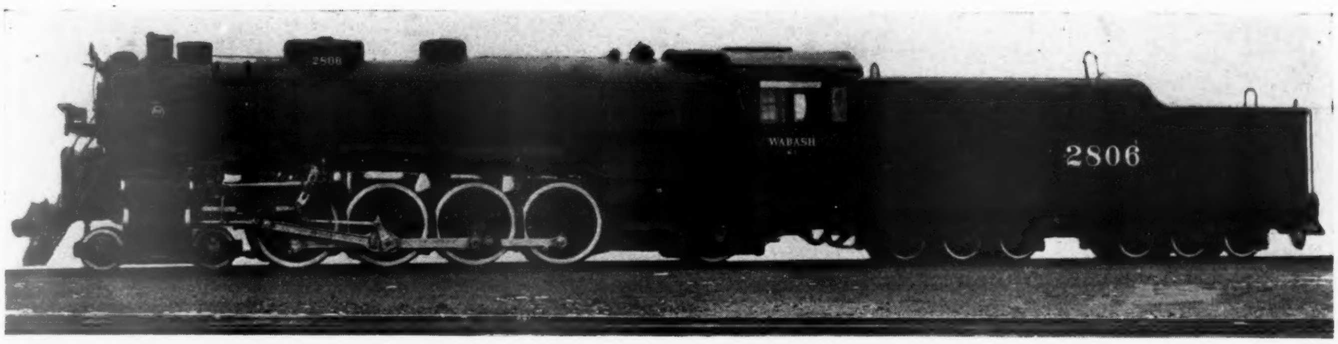
The above performances showed conclusively the importance of adhering to input schedules on the same basis as output schedules and, when this is done, the same policy automatically is extended to the subdepartments and individual groups with the important result that both foreman and men are looking for work to reach their respective departments on time in order that the schedule output may be maintained.

As a means to an end, in making more efficient, lower cost maintenance, the Missouri Pacific man-hour production control plan has proved its worth, operating smoothly and with the thorough co-operation of those interested. Throughout the development of the plan, it has been constantly explained, interpreted and "sold" both to shop men and supervisors, which accounts to a large degree for its success.

THE SOUTHWARK FOUNDRY & MACHINE COMPANY, Philadelphia, Pa., has recently completed a Southwark-Emery universal testing machine of 3,000,000 lb. capacity which is to be erected at the University of Illinois. The machine is provided with a maximum opening for tension and completion of 38½ ft., a clear distance between the columns of 7½ ft. and a 36-in. stroke. It is a single-cylinder machine with the Emery weighing system in the central crosshead, and by this construction can accommodate traverse specimens limited in length only by the size of the building in which the machine is installed.



Cross sections and elevation of the Wabash 4-8-4 type locomotive



One of the 4-8-2 type locomotives built for the Wabash by the Baldwin Locomotive Works

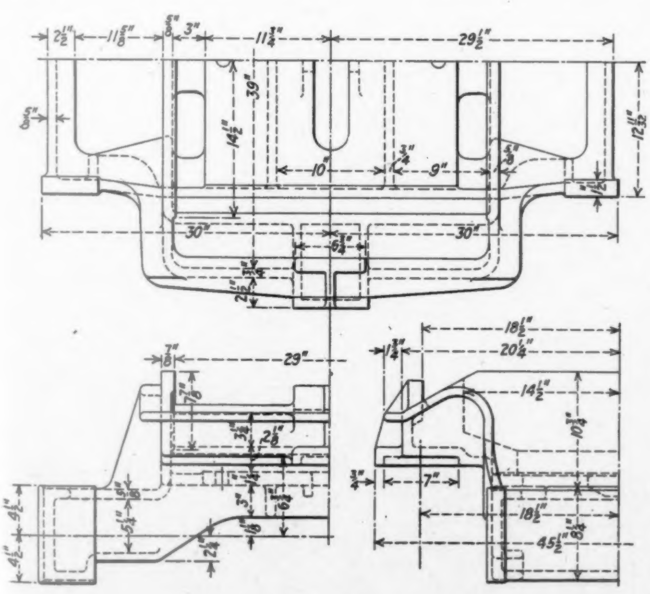
Wabash Purchases Twenty-Five 4-8-2 Type Locomotives

For fast freight service—Develop 66,568 lb. tractive force with 70-in. drivers

THE Wabash recently placed in service 25 Mountain type locomotives built by the Baldwin Locomotive Works. These locomotives, with 27-in. by 32-in. cylinders, 70-in. driving wheels, carrying 235 lb. boiler pressure and developing a tractive force of 66,568 lb., will replace Mikado type locomotives which have 27-in. by 32-in. cylinders, 64-in. driving wheels, 210 lb. steam pressure and which develop 65,063 lb. tractive force without the booster. Some of the replaced locomotives are booster equipped, which increases the tractive force of these engines to 76,899 lb. None of the new locomotives is equipped with boosters, although each is so designed to permit booster application in the event that the engines are assigned to districts of less favorable grade conditions than the ones on which they are now operating.

Although the initial starting force of the new locomotives is less than that of the replaced engines, they have been designed to develop and sustain a high tractive force at high speeds for the purpose of handling the increasing number of fast-freight trains which represent the bulk of the business between Decatur, Ill., and Montpelier, Ohio, which are terminals on the divisions to which these new 4-8-2 type locomotives have been assigned.

These locomotives with a total weight of 697,400 lb., 270,400 lb. of which is on the driving wheels, incorporate a number of the latest developments in locomotive design. They are equipped with the Alco outside bearing engine trucks, the Alemite system of lubrication for all bearing points, except the stoker drive-shaft bearings and universal joints, with roller bearings on the tender trucks of five engines and the vestibule type of cab. The factor of adhesion of these engines is 4.07. Other important dimensions, weights and proportions are shown in one of the tables.



Engine-truck swing-frame

The Alco Engine Truck

The four-wheel, outside-bearing engine truck is of the American Locomotive Company design, with geared-roller resistance, 6-in. by 11-in. bearings and 33-in. heat-treated rolled-steel wheels. The truck consists of a swing frame and bolster, two journal-box castings, each incorporating a pair of journal boxes, and two equalizers. The details of these parts and the assembly of the truck are shown in the drawings. The swing frame which carries the geared roller resistance has machined surfaces at the four corners and fits with close clearance into the journal-box castings which are of a floating type. The weight of the engine is transmitted by the swing frame and bolster to two semi-elliptical springs which are supported by the two

equalizers that bridge the floating journal-box castings. The equalizers, yoked over the box castings on the inside of the wheels, rest upon rollers, two of the rollers at diagonally opposite corners of the truck being parallel to the horizontal center line of the truck, while those at the other diagonally opposite corners are parallel to the center lines of the axles. Cast-steel with chromium content up to 1.5 per cent is used for the wearing castings on this truck.

Other Design Features

Hard grease is used for the main- and side-rod bearings and for the back end of the eccentric rod. Aside from the main valves and the cylinders, the air pumps, feedwater pump and the stoker-engine and drive-shaft bearings and universal joints, the remaining wearing parts are lubricated by the Alemite system, including the following: Wrist pins, hub liners, all valve-motion parts, guides, shoes and wedges, knuckle pins, radial buffer, furnace bearers, trailer rockers, drawbar pins, bell shaft, throttle rigging, lubricator arm, reverse gear, brake rigging, center plates, pedestals, radius-bar pin, lateral-motion device and spring rigging. Air-operated grease guns are used to apply hard grease at each terminal, soft grease for certain parts after each round trip and soft grease for other parts at monthly inspections.

Lubrication for the main valves and cylinders is provided by a 24-pt. Schlacks force-feed lubricator, operated by a horizontal extension at the top of the com-

Table Showing the Principal Weights, Dimensions and Proportions of the Milwaukee 4-8-2 Type Locomotives

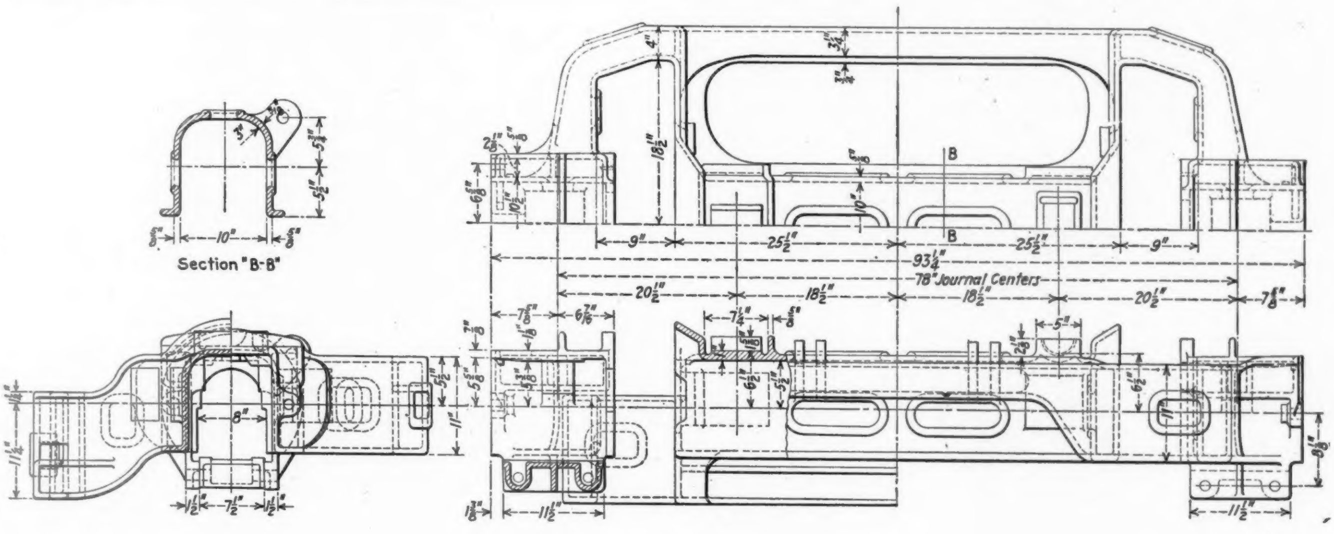
Railroad	Wabash
Builder	Baldwin Locomotive Works
Type	4-8-2
Service	Freight
Cylinders, diameter and stroke	27 in. by 32 in.
Valve gear, type	Walschaert
Valves, piston type, diameter	12 in.
Weights in working order:	
On drivers	270,400 lb.
On front truck	72,100 lb.
On trailing truck	63,900 lb.
Total engine	406,400 lb.
Tender	291,000 lb.
Wheel bases:	
Driving	18 ft. 3 in.
Total engine	41 ft. 11 in.
Total engine and tender	83 ft. 10 in.
Wheels, diameter outside tires:	
Driving	70 in.
Front truck	33 in.
Trailing truck	44 in.
Journals, diameter and length:	
Driving, main	12½ in. by 14 in.
Driving, others	11 in. by 14 in.
Front truck	6 in. by 11 in.
Trailing truck	9 in. by 16 in.
Boiler:	
Type	Ext. wagon top
Steam pressure	235 lb. sq. in.
Fuel, kind	Bituminous coal
Diameter, first ring, inside	82½ in.
Firebox, length and width	126 in. by 96¼ in.
Tubes, number and diameter	67—2¼ in. O.D.
Flues, number and diameter	186—3½ in. O.D.
Length over tube sheets	20 ft. 0 in.
Grate area	84.2 sq. ft.
Heating surfaces:	
Firebox and combustion chamber	333 sq. ft.
Arch tubes	26 sq. ft.
Thermic syphons	82 sq. ft.
Tubes and flues	4,179 sq. ft.
Total evaporative	4,620 sq. ft.
Superheating	2,004 sq. ft.
Combined evaporative and superheat	7,626 sq. ft.
Maximum rated tractive force	66,568 lb.
Weight proportions:	
Weight on drivers ÷ total weight engine, per cent	66.53
Weight on drivers ÷ tractive force	4.07
Total weight engine ÷ comb. heating surface	53.29
Boiler proportions:	
Tractive force ÷ comb. heating surface	8.73
Tractive force × diam. drivers ÷ comb. heat. surface	611.1
Firebox heating surface per cent of evap. heat. surface	8.98
Superheat. surface per cent of evap. heat. surface	43.38
Firebox heat. surface ÷ grate area	4.93

List of Special Parts, Appliances and Equipment Applied on the Wabash 4-8-2 Type Locomotives

Railroad	Wabash
Builder	Baldwin Locomotive Works
Service	Freight
No. built	25
Firebox and boiler:	
Blower fitting	Barco
Blower valve	Okadee
Blow-off cocks	Okadee
Boiler and firebox steel	(20 locos.) Otis and (5 locos.) Lukens
Boiler checks	(20) Nathan and (5) Sellers
Boiler jacket	Copper bearing steel
Driving throttle valves	Ohio Injector Co.
Exhaust steam injectors	(5 locos.) Sellers
Feedwater heater and pump	(20 locos.) Worthington
Fire brick arch	Economy Arch Co.
Firedoor	Franklin Ry. Supply Co.
Firedoor flange	O'Connor
Flexible staybolts	Flannery
Gage cocks	Sargent
Gage glasses	Nathan
Gage glass guards	Nathan
Grates	Hulson tuyere type
Injectors	Hancock
Injector starting valve	Hancock
Lagging	Johns-Manville
Piping	Byers wrought iron
Pipe wrapping	Union Asbestos & Rubber Co.
Rivets	Steel, Camden Rivet Co.
Safety valves	Consolidated
Smokebox hinges	Okadee
Smokebox netting	Draftac
Smoke suppressor nozzle	T-Z Railway Equipment
Smoke suppressor valve	Okadee
Spark arrester	Draftac
Staybolt iron	Lewis Special mfd. by Penn, purchased from Ryerson & Son
Steam gage	Ashton
Steam pipe casing	Alco
Steam valves	Hancock
Stoker	Standard, type BK
Stoker steam gage	Ashton
Superheater	Type E
Thermic syphons	Locomotive Firebox Co.
Throttle	Bradford Corp.
Throttle compensating lever	Jones
Throttle rod stuffing box	Gustin-Bacon
Tubes and flues	(20) National Tube Co. and (5) Pittsburgh Steel Products Co.
Washout plugs	Huron
Water column	Nathan
Whistle	Hancock
Cylinders and Running Gear:	
Back engine truck	Commonwealth
Bed frame	Union Steel
Brake shoes	American Brake Shoe Foundries
Brasses	National Bearing Metals Co.
Connecting rods	
Cradle	Commonwealth
Crank pins	Carbon Vanadium
Crossheads	Laird
Crosshead guides	Laird
Crosshead shoes	Laird
Cylinders	Cast-steel
Cylinder and valve bushings	Hunt-Spiller
Cylinder and valve packing	Hunt-Spiller
Cylinder cocks	Okadee
Cylinder safety valve	Okadee
Driving box cellars	Nugent Steel Castings
Driving box lubricators	Franklin
Driving box spreaders	Alco
Driving axles	Carbon Vanadium
Driving tires	Railway Steel Springs
Flange oiler	Detroit
Frames	Vanadium cast-steel
Front engine truck	Alco
Front engine truck centering device	Union Steel Castings
Front truck axles	Carnegie
Lateral motion device	Alco
Lubricator—Hydrostatic	Detroit
Lubricator—Mechanical	Schlacks, U. S. Met. Pkg. Co.
Metallic packing	U. S. Met. Pkg. Co.
Pedestal wedges	Franklin
Oil cups	Alemite
Power reverse gear	Alco
Rods—main and side	Carbon Vanadium
Running gear lubrication	Alemite
Springs	Railway Steel Springs
Valve gear	Walschaert
Cab and Miscellaneous:	
Air brake gages	Ashton
Air manifold	Edna
Bell ringer	Viloco
Brakes	Westinghouse 6-ET
Brake, foundation	American WN-40
Cab apron	Ryerson
Cab seats	Gustin-Bacon
Cab windows	Prime
Cab windshields	Prime
Cut-off control gage	(20) Ashcroft and (5) Ashton
Draw bars	Franklin
Engine coupler	National Malleable & Steel Castings
Front bumper	Commonwealth
Headlight equipment	Pyle-National
Markers, classification lamps	Pyle National
Paint	(5) Duco, (20) Mountain Paint & Varnish Co.
Radium buffer	Franklin
Rerailers	Buda
Sanders	(20) Graham-White (5) U. S. Met. Pkg. Co.

Steam heat	Vapor Car Heating Co.
Wiring	American Steel and Wire
Tender:	
Coupler retainers	Western Railway Equipment Co.
Draft gear	W. H. Miner
Engine and tender connections	Barco
Farlow attachments	Symington
Material for tanks	Carnegie
Roller bearing equipment	(5) American Steel Foundries—Davis wheels (3) Timken (2) Schafer
Tank hose	Gustin-Bacon
Tank hose strainers	Hancock
Tank valves	Everlasting
Tender coupler	National Malleable & Steel Castings
Tender coupler centering device	Union Metal Products Co.
Tender frame	Commonwealth

at the front of the cab and drop windows in the side doors. There are steel partitions with drop windows back of both engineman and fireman. The brakeman is provided with a drop seat behind the partition directly back of the fireman, adjacent to the cab door. A similar seat is provided on the right side for the use of any supervisor who may be riding the engine. Overhead racks are provided for the enginemen's suit cases, while a compartment for tools is located on each side under the deck. All steam supply valves are located



The engine-truck-box casting

Tender journal boxes	Symington
Tender journal box dust guard	H. Sharp Co.
Tender journal box wedges	Western Railway Equipment Co.
Tender trucks	Commonwealth
Tender truck side bearings	W. H. Miner
Tender wheels	(20) Standard Steel

on a turret outside and just ahead of the cab, with operating levers extending back into the cab within easy reach of the crew.

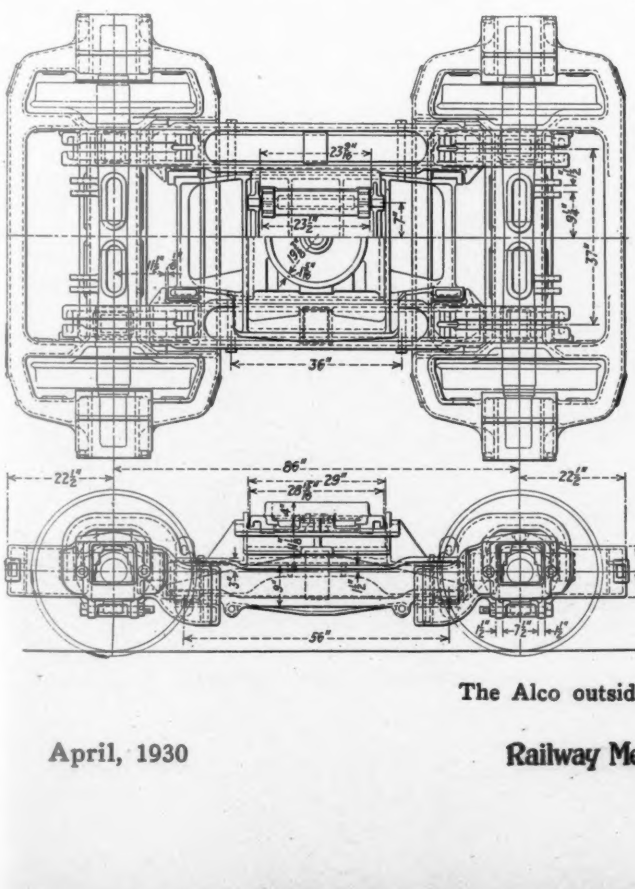
bination lever. A three-feed Detroit hydrostatic bullseye lubricator is used for the air pumps, feedwater pump and stoker engine.

Ample ventilation is provided in the vestibule cab through top ventilators, side ventilators near the deck

Counterbalancing the Reciprocating Parts

Another important feature in connection with the design of these engines is the method of counterbalancing the reciprocating weights to reduce the hammer blow and side thrust on the rails at high speeds. The 70-in. driving wheels make possible a complete balancing of the rotating weights on the main driving wheels and an equal distribution among the four pairs of drivers of 50 per cent of the reciprocating weights. At the same time, the latest practice of cross-counterbalancing for out-of-plane rotating parts on the main drivers is used, which results in the main counterbalance weight on these engines being 7 deg. 40 min. off the quarter.

The main cylinders are of cast steel, with ¾-in. Hunt-Spiller bushings. The piston valves, with a diameter of 12 in. and having an 8-in. travel, are actuated by Walschaert valve motion. The piston rods and valve stems are of chrome-vanadium steel with King type of packing for the glands. Carbon-vanadium steel is used for the driving axles, all crank pins and main and side rods, while the main frames, crossheads and driving wheel centers are of vanadium cast steel. A departure from Wabash standard practice was



The Alco outside-bearing engine truck

The locomotives are equipped with the Westinghouse Pedestal-type brake-valve stand

made in the use of the Laird type of crosshead and guides, this being advisable in connection with the use of the outside-bearing engine trucks.

The boilers of these locomotives are of the extended wagon-top type, with an inside diameter of 82½ in. at the front course and increased to 92 in. at the combustion chamber which is 45 in. long. All the engines have two Nicholson thermic syphons and three 3½-in. arch tubes. The tubes and flues are made from hot-rolled seamless steel, there being 67, 2¼-in. and 186, 3½-in. flues, 20 ft. long. The grate area is 84 sq. ft.

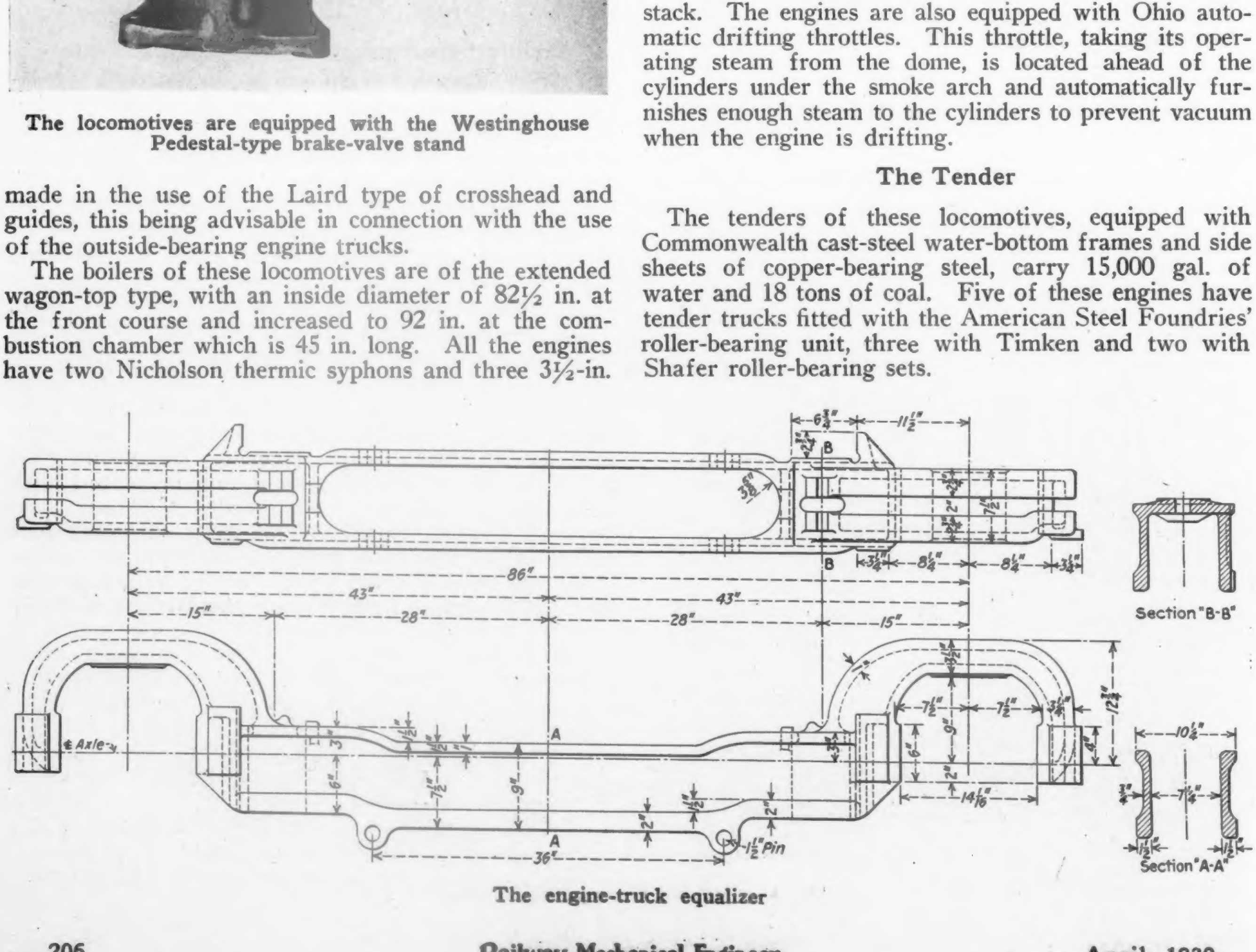
All rigid staybolts 10½ in. or less in length are hollow-drilled with a 7/32-in. hole for the entire length. Taper-thread radials are used for seven rows on each side of the center line of the crown sheet for the full length of the firebox, with the exception of the four front rows which are Flannery flexibles with straight threads and riveted over in the crown sheet. About 700 Flannery flexibles with welded sleeves are used in the throat and so-called breaking zones.

The Type E superheater units used are the first to be installed on any Wabash locomotive. There are 186 units with a superheating surface of 2,004 sq. ft., which gives a percentage ratio of superheating surface to evaporative surface of 43.38, which compares with 24.51 for the locomotives which the new engines replaced. The engines are also equipped with the Bradford front-end throttle. Twenty of them have Worthington 5S-type feedwater heaters, while the remaining five are equipped with Sellers exhaust-steam injectors. All the locomotives have Hancock non-lifting injectors.

All the locomotives are equipped with the Standard BK stoker, with the stoker engine located in a compartment at the left front corner of the tender. The exhaust steam from the stoker engine is discharged into the water in the tender at a point near the center and 24 in. above the bottom of the tank. Superheated steam for the whistle and blower valve is taken from a manifold attached to the smoke arch on the left side of the engine which takes steam from the superheater-steam header. The whistle, operated by a Viloco air-operated device and also provided for manual operation, is located on a bracket at the left side of the smoke stack. The engines are also equipped with Ohio automatic drifting throttles. This throttle, taking its operating steam from the dome, is located ahead of the cylinders under the smoke arch and automatically furnishes enough steam to the cylinders to prevent vacuum when the engine is drifting.

The Tender

The tenders of these locomotives, equipped with Commonwealth cast-steel water-bottom frames and side sheets of copper-bearing steel, carry 15,000 gal. of water and 18 tons of coal. Five of these engines have tender trucks fitted with the American Steel Foundries' roller-bearing unit, three with Timken and two with Shafer roller-bearing sets.



The engine-truck equalizer

Draft Distribution in the Firebox

(Continued from page 188)

Kansas, Alabama and Oklahoma coals could be burned without trouble in fires of uniform depth.

Draft Distribution with an Open Arch

Before concluding the experiments the effect of moving the arch back from the throat sheet by means of spacer brick was tried. The immediate result was to increase the draft in the front of the firebox until it was nearly equal to that in the rear, and there was a decided tendency to pull the fire in the front of the firebox. This could have been overcome by reducing the air openings in the grates at the points affected, but the draft readings indicated that an open arch was not desirable.

Fig. 4 shows that the draft readings in the firebox are increased by opening the arch. Superimposed on Fig. 3, it shows that the draft is increased for 30 in. back of the throat sheet. This indicates that the products of combustion from about the front 25 per cent of the grates pass through the space between the throat sheet and the toe of the open arch.

The function of the arch, besides helping ignition of green coal through reflected heat, is to increase the length of travel of the products of combustion so that the air and volatile gases are thoroughly mixed, and ample time is allowed for burning the volatiles. The front portion of the grate area, being only a few feet away from the tube sheet, needs a lengthened travel for its products of combustion more than the rear portion of the grate area. Yet opening the arch allows the products of combustion of some 25 per cent of the grate to by-pass directly into the flues, releasing the gases before combustion has been completed, cooling off the lower flues and causing black smoke at the stack. It was, therefore, evident that an open arch is undesirable.

The 25-35-Per Cent Grates in Service

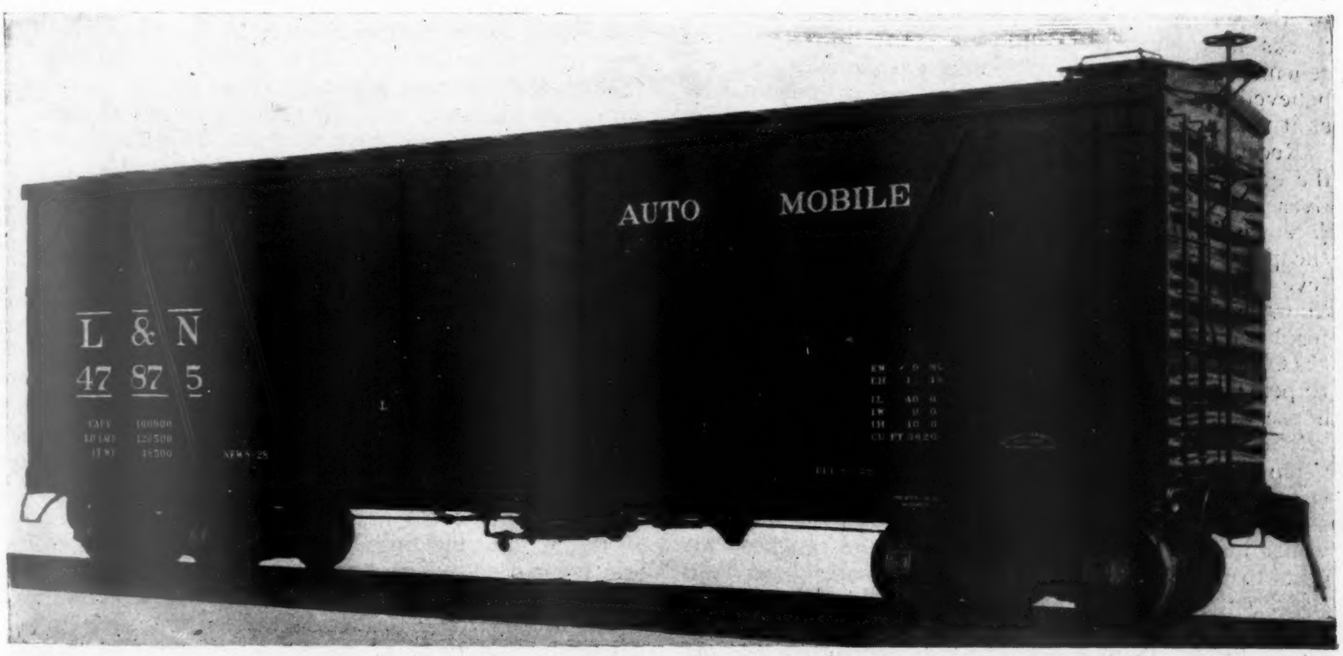
"The proof of the pudding is in the eating." If actual results do not bear out a theory, the theory must be discarded. Several locomotives equipped with the 25-35-per cent grates were placed in service to determine conclusively whether the test results were correct and the readings obtained properly interpreted. The master mechanics were asked for a statement as to their performance and all were favorable, many suggesting that the 25-35-per cent grates be adopted as standard equipment. The opinions of the various master mechanics and road foremen being entirely in favor of the grates, they were adopted as standard on the 4100-class locomotives and their use is now being extended to other classes of power.

Renovating Oil and Waste on the D. & H.

(Continued from page 194)

way of illustration, zone No. 3, comprises four stations, viz: Colonie, N. Y., Green Island, Mechanicville, and Glenville. A car is loaded at the plant with the packing as requisitioned and the barrels are delivered to the stations in the order named. Each point receives an advance shipping notice and, when a shipment is received, the number of barrels consigned to it is removed and the car is reloaded with the old packing on hand. Acknowledgment of the material received is made on this shipping notice together with a notation of the number of barrels of packing returned to Oneonta for reclamation. By this system, shipments are made in substantial quantities and empty mileage is reduced to a minimum. Moreover, advance knowledge is had of the packing en route for reclamation.

* * *



Louisville & Nashville 50-ton single-sheathed automobile car built by the Mt. Vernon Car Manufacturing Company, August, 1928

EDITORIALS

Curing Careless Welders

WELDING, when compared with other crafts, is comparatively new in the railroad industry. For that reason a large amount of literature and instruction pamphlets on the subject of welding have been circulated among the men engaged in or concerned in any way with welding work. Nevertheless, it is surprising how some men, both welders and foremen, persist in misusing the welding torch.

An engine failure was recently caused by the breaking of the studs which secured the throttle lever fulcrum to the boiler. One stud showed evidence of having been welded. Another instance was that of a welder who used a side rod on which to lay material he was cutting with an acetylene torch. This, of course, heated the side rod, setting up internal stresses and effecting changes in the structure of the steel which are liable to result in failure and endanger human life.

Only the worst kind of carelessness should cause a welder to resort to such practices or a foreman to countenance them. There is only one way to cure this—close supervision, proper instructions and strict discipline.

Controlling Expenses

IN all probability, the subject of reducing costs creates more correspondence within a railroad organization than any other. Frequently, especially when business is poor, a mechanical-department supervisor receives a letter from his superior to the effect that the cost of performing some item of work under his supervision is too high and must be reduced. The recipient of the letter may have been cudgeling his brain for weeks and lying awake nights working out various schemes for doing that particular job until he sincerely believed that the work was being done as economically as it was possible to do it.

Recently the head of a mechanical department raised the question of reducing the cost of handling locomotives at engine terminals. Several of the enginehouse foremen stated that they could not do the work any cheaper and do it effectively. The ensuing discussion revealed the fact that many of the foremen did not know what items of expense entered into the cost. The result of the discussion was that a copy of the I. C. C. Classification of Operating Revenues and Operating Expenses of Steam Roads was ordered for each enginehouse foreman.

The good railroad shop foreman knows how to develop and utilize labor- and time-saving devices for reducing the cost of the work being done under his supervision. After all, it is only through the effective utilization of men and equipment that he can keep his costs to a minimum. Some foremen, more clever than wise, can use their knowledge of shop accounting methods to give the impression that their department is more efficient than is actually the case. Like the old adage which says, "Figures don't lie, but liars can figure."

The foreman who really desires to have his department function as effectively as possible, however, will find it worth while to learn the structure of the accounts to which expenditures under his supervision are charged. He will then be able much more intelligently to interpret statements showing the cost of handling the work for which he is responsible and can make them an aid in the effective control of his operations. The sooner a foreman learns to understand and to use such statistical information, the sooner he is fitted for promotion.

Recognition of Railway Mechanical Progress

THE mechanical-department officer is a busy man who has little time for outside activities. Therefore, when it is reported that a number of mechanical engineers employed in the railroad industry and in closely allied fields compose one of the strongest and best organized groups among 15 others representing the interests of 14 leading industries in a national engineering society, the fact is worthy of note.

The group referred to is the Railroad Division of the American Society of Mechanical Engineers. This division was reorganized in 1925 with a registration of approximately 425. At the present time the total registration is 1,200 mechanical engineers who are employed by the railroad and railway supply industries, or are engaged in technical research, education, and private practice.

A brief review of the work that the Railroad Division has done during the past year illustrates one of its most useful functions. A joint session was held last June with the American Society of Refrigerating Engineers at State College, Pa., at which the Railroad Division presented two papers. These papers were prepared and presented with the primary object of showing the refrigerating engineers what had been accomplished by the railroads, and what refrigerating problems were yet to be solved in the transportation and storage of perishable commodities. Another joint meeting was held during the annual meeting of the society last December, with the Oil and Gas Power Division, A.S.M.E., at which the Railroad Division presented the problems that were being encountered in the maintenance of various types and designs of rail-motor cars. In addition to these two special sessions with representatives of the manufacturing industries, the Railroad Division also held two technical sessions during the annual meeting at which four papers were presented showing the progress being made in railroad mechanical department work, and the developments in motive power and equipment. A joint meeting during which the subject of air brakes was discussed was held last January with the New York Railroad and Manhattan Air Brake Clubs.

The work of the Railroad Division, not only in the American Society of Mechanical Engineers, but also in cooperation with other organizations, is becoming a factor in the development of good will and prestige for

the railroad industry by correctly presenting to the technical world the developments and progress being made by the railroads.

Draft Control

THE control of draft over a locomotive firebox is a problem which has confronted mechanical officers in charge of locomotive operation and performance and which has had several solutions, each depending on the conditions under which the locomotive operates and the kind of fuel used. One of the most popular solutions and the one which is generally accepted is that draft equalization can be accomplished by adjusting the height of the draft plate in the front end. This conclusion has found favor because the lowering of the draft plate stops the tearing of the fire at the points of greatest draft because of the pulsating action of the exhaust. As a result many locomotives of a single class have different heights of draft plates, each of which, in the opinion of the officer in charge of performance, is the height at which the draft is equalized in each particular locomotive.

The extent to which the draft is actually equalized by this practice is apparently a matter of opinion. During recent tests, the results of which are presented in an article by S. H. Acker, assistant engineer of tests of the St. Louis-San Francisco published in this issue, it was determined that the adjustment of the draft plate does not affect the distribution of the draft over the grate but that its only result is a change in the distribution of the draft with respect to time. That is, the lowering of the draft plate may restrict the passage of the products of combustion from the grates to the front end to such an extent that the pulsating effect of the exhaust does not carry back to the firebox and the tendency to tear the fire is thus reduced. Under all conditions of draft-plate adjustment during the tests there was practically no change in the relative force of the draft in the front and rear of the firebox. Apparently, then, one theory of draft distribution has been exploded by actual tests and light thrown on one of the mysteries of locomotive drafting.

What Is a Hot Box?

A LETTER appears on the Reader's Page of this issue calling our attention to the fact that the two roads referred to in an editorial in the February issue on renovating journal packing did not compile their hot-box figures on the basis of the A.R.A. definition. This letter brings up a very good point; namely, the necessity of eliminating the human equation in determining hot-box figures. It is well known that one conductor will take more chances than another in attempting to save time by moving a car into the next terminal without stopping to treat a journal which is running hot.

The importance of the human element in hot-box prevention was discussed in an editorial in the March issue. It is something which can never be exactly evaluated and always brings an element of uncertainty into the problem. Undoubtedly, the present A.R.A. definition is satisfactory from the standpoint of the operating department. Its principal concern is to get trains over the road with the fewest possible delays. On the other hand, the mechanical department is not only interested in reducing the number of delays to freight and passenger trains on account of mechanical defects, but is also interested in keeping its maintenance costs down to a minimum.

The crux of the problem can be stated in a few words. A number of railroads are now spending considerable sums of money in building and operating renovating plants of their own design or for the renovation of journal packing on a contract basis. The only reasons for this expenditure are to keep to a minimum the number of delays to passenger and freight trains because of hot boxes, and to do this at a minimum cost of journal lubrication. The monthly record of the number of freight and passenger car-miles per hot box is one yard stick which the mechanical department can use advantageously to measure the effectiveness of its program.

Although the present A.R.A. definition of a hot box has only been in effect since 1928 it is apparent that a stricter definition should be adopted to meet the requirements of the mechanical department. Treating a hot journal is an expense in labor and material whether or not the train is delayed, the car set out or hauled to the next terminal. Therefore, the following definition of a hot box is suggested in lieu of the present A.R.A. definition: "A hot box is a box heated above normal temperature requiring treatment."

Hot-box figures compiled on the basis of this definition would give the mechanical department a record with which it could better check the effectiveness of its inspectors and journal-box packers, in addition to the quality of its renovated oil and waste. At the same time, the objectives of the operating department would be obtained. Readers of the *Railway Mechanical Engineer* are invited to express their views as to the practicability of this definition.

Convention Papers and Discussions

THE opening of the convention season with the meetings of the International Railway Fuel Association and the Air Brake Association in Chicago, on May 6 and May 13, respectively, brings up a point relative to the handling of papers which has been a subject of comment by many mechanical department officers during the past two or three years. One of the weaknesses of the convention programs of the mechanical-department associations has been the ensuing discussions after the presentation of a paper or report. It has frequently happened that the discussion of a paper of high standard has offered nothing in the way of information or helpfulness. This has also occurred with papers containing considerable material of a controversial nature which were prepared by the authors with the hope that the discussion might crystallize opinion and clarify the subjects. On the other hand representatives of different railroads have made remarks during the discussion of a paper which have turned out to be embarrassing to the railroad. As a result a number of mechanical-department officers have forbidden members of their staff attending conventions to make any remarks on the floor of the convention hall whatsoever.

One cause of this difficulty is that some of the

mechanical-department associations do not distribute advance copies of their papers to the membership, thus making it impossible for the members to come to the convention after having made a sufficient study of the subjects of the papers and reports so that they may discuss them with assurance. After one arrives at the convention there is little time available in which to make a careful study of the papers, even if they are available before they are presented on the floor of the meeting.

Many technical societies and associations—some of them in the railroad field—require papers and reports to be in hand weeks, or even months, before the date of the meeting at which they are to be presented. The American Society of Mechanical Engineers, for example, has a strict rule that all papers to be presented at any of its sessions must be in the hands of the committee responsible for its programs two months before the time that the paper is to be presented If this rule is not complied with, the paper is simply marked off the program. Needless to say, this policy is an important factor in the securing of a discussion of high quality and constructive value. Considering the character and membership of the average mechanical department association, is there any reason why most of the papers could not be prepared at an earlier date, edited and printed for distribution well in advance of the conventions? Such a practice gives the membership an opportunity to make the discussions worth while and also to make the work of the association a real contribution to progress in their branches of the railroad business.

Reciprocal Buying

At Chicago on March 25, 1930, the Federal Trade Commission completed a hearing, begun at Chicago on February 17, on its own formal complaint charging the Mechanical Manufacturing Company and the officers of Swift & Co. witth using unfair methods of promoting sales and selling to the railroads in violation of Section 5 of the Federal Trade Commission Act. While the complaint specifies bumping posts and other equipment as well as draft gears, much of the evidence brought out during the hearings refers to the methods employed by R. O'Hara and W. A. Mayfield, traffic manager and assistant traffic manager, respectively, of Swift & Co., in soliciting orders for the Durable draft gear from railroads. The evidence showed that approximately fifty-two thousand of seventy-five thousand shares of the common stock of the Mechanical Manufacturing Company were held by officers of Swift & Co. or members of the Swift family and that more than four-fifths of the preferred stock was similarly held.

The evidence presents a picture of solicitation for draft gear orders either from the traffic officers or executive officers of the railroads on a reciprocity basis. Letters of the Swift & Co. traffic manager to officers of some railroads, which were known to be in the market for a considerable number of freight cars, clearly indicate that he expected orders for Durable draft gears in some instances for as many as one-third of the cars for which orders were being placed. Officers of more than twenty railroads testified as to the methods employed in soliciting their orders for the Durable draft gear. Gears were purchased by different railroads in numbers varying from a few car sets for test to two thousand gears for application to new and repaired cars. The testimony of mechanical officers of sixteen of the roads was taken as to their opinion of the quality of the gear. In the case of twelve roads the opinions of the mechanical officers were unfavorable. A number of purchasing officers testified that the price of the gear was higher than that of other gears purchased by their roads.

The testimony suggests that in most cases where this gear was purchased the outstanding motive for giving it serious consideration was the hope of an increase or the fear of a decrease in traffic controlled by Swift & Co. or its officers. The evidence brought out at the hearings would indicate, the railroads which purchased Durable draft gears appear to have been somewhat disappointed in their hope of receiving valuable favors in return and, in at least one case, on a road which definitely refused to consider the Durable draft gear no loss of traffic was observed. At the conclusion of the hearing, under cross-examination by the attorney for the respondents, Mr. O'Hara is reported to have said that he had never utilized a pound of Swift & Co. traffic to solicit a sale of Mechanical Manufacturing Company gears, that he had never sought to sell devices on the premise of traffic from Swift & Co. or its subsidiaries, and that he had never routed traffic against railroads refusing to buy from the Mechanical Manufacturing Company and had never routed traffic in favor of railroads buying the draft gear made by that company.

What action the Federal Trade Commission will take in the matter under the law must await the decision of the commission after its study of the evidence. A review of the evidence, however, suggests that those railroads which were most easily influenced to purchase this draft gear by the promise of favors or the fear of reprisals, against the judgment of their mechanical officers, will soon find themselves faced with increases in maintenance expense, in return for which they will have little to show.

NEW BOOKS

MATERIALS HANDBOOK. *By George S. Brady, associate editor, American Machinist. 428 pages, 4 in. by 7 in. Bound in leather. Published by the McGraw-Hill Book Company, Inc., 370 Seventh avenue, New York. Price $4.*

The material in this book has been gathered over a considerable period through constant contact with a wide range of authorities and manufacturers, and by correspondence with the latter, in an endeavor to meet the need for a concise encyclopedia that would give the purchasing department, the production executive, the engineers and foremen in the average shop the principal distinguishing data on such raw materials as alloy and special steels, alloy bronzes and brasses and other materials which have recently evolved themselves into a new branch of engineering. The classification of the materials in this handbook is general, the descriptions of material groups and of individual materials being alphabetically arranged. The material groups cover abrasives; brasses and bronzes; building materials; corrosion-resistant and cupro-nickel alloys; fabrics, leathers, organic materials; finishing materials, industrial chemicals; minerals; oils and greases; steels, ano other materials used in industry.

THE READER'S PAGE

The Definition of a Hot Box

Greenville, Pa.

To the Editor:

Two definitions for a hot box are given in the editorial in your February issue on the renovation of journal packing, and neither of them appears to conform to the American Railway Association definition of a hot box as shown in Circular DV 596, issued in 1928, which says: "In order to have a standard method of reporting hot boxes, a hot box is defined as a box heated above normal temperature so as to require setting car out, or requiring treatment to take the car to terminal."

The human equation is not even then eliminated for one conductor will take more chances than another in attempting to save time by moving a car into the terminal without stopping to treat it. If we would all use the A.R.A. definition for a hot box, it would give us a somewhat better chance to compare our own results with such studies as appear in your editorial.

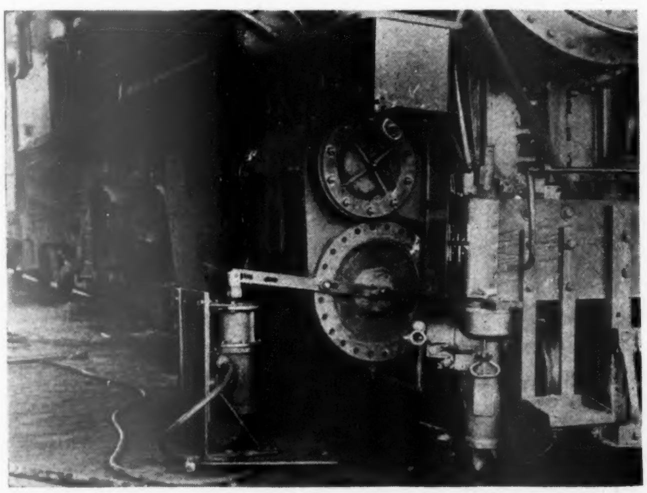
A. M. Orr.

When Air is Not "Free"

Chicago, Ill.

To the Editor:

Air is commonly said to be "free," but, if by "free" we mean obtainable without cost, the expression hardly



Does this device save as much time and labor as it wastes in compressed air?

applies to compressed air, except that supplied at automobile garages and service stations which usually include the cost in their charge for gasoline, oil and service. Railroads are among the largest users of compressed air for almost every conceivable purpose, including railroad shops, enginehouses, rip tracks and yards. How many shop supervisors realize how much this air costs and that it is a relatively expensive commodity? Probably not one in twenty, if we may judge by the waste and inefficient uses of air readily noticeable about almost any railroad plant.

The accompanying illustration shows a typical method of using the steam end and center casting of a 9½-in. Westinghouse air compressor, connected to the shop air line and arranged to perform a mechanical operation. Will any shop supervisor stand up in meeting and be so bold as to defend this practice? In the first place, the air is used without expansion and, therefore, inefficiently. In the second place, at 90 lb. pressure and with a 9½-in. piston, far more power is available than needed. In the third place, the operation is too slow. In the fourth place, all front end cylinder head joints do not need to be ground.

It seems that whenever a shop foreman or mechanic notices a manual operation which he believes could be done better by power, his first thought is to devise a home-made apparatus, involving the use of a brake cylinder and piston or the steam end and center casting of a Westinghouse 9½-in. air compressor, which can usually be secured without charge to capital account and used without much, if any, check on the cost of the air consumption. Literally, thousands of these devices are in service in railway shops and most of them waste more money in a day than they save in a week. Brake cylinders, 14 in. or 16 in. in diameter and furnishing the power for home-made bulldozers, for example, are not infrequently observed bending small stock which could almost be formed in a hand vice. It would be interesting to see any figures which could be developed, justifying this and similar practices from the standpoint of time and labor saving, as compared with the operating cost of the pneumatic devices.

Shop Engineer

Mechanics Needed— Not Specialists

Lorain, Ohio.

To the Editor:

The letter from R. R. Howarth in the January number of the *Railway Mechanical Engineer*, regarding the problem of apprentice employment, was interesting, but I must take exception to his statement that the present system of apprentice training is mostly bunk.

In the shops where I am employed machinist, apprentices are started at the foot of the ladder, generally the small drill press, then to the large ones, and so on, until they have a good working knowledge of all machines used in the course of railroad running repairs. Then they are sent out into the roundhouse on drop pit and running repair work, including cab and air work; then to the burning and welding outfit; then to the car department for axle turning work.

At the end of the course, if the apprentice is not an all-around machinist, it is not the fault of the system. But, you say, "Now he is up against it for a job." I admit that the prospects of a job are slim, but let's not damn the system for that. In my opinion the finished apprentice, who has not others dependent upon him, is a mighty poor stick for continuing on his apprentice rate after graduation without trying to get out and absorb experience in other shops, which would ultimately be of benefit to him and his employers.

Yes, the trend is towards specializing, but there are

many shops where the all-around man is a decided asset and, likewise, a necessity. My first contact with a "specialist" came while working in a railroad boiler shop as a helper. At that time when an engine tender became noticeable for the number of patches applied to keep it together, the boss would tell off boilermakers and helpers to build a duplicate—no blueprints, just measure up the old tank and go to it. A new man came, who advertised himself as a "tank man" for a locomotive works. The boilermakers concluded that henceforth their time would be spent on boiler repairs only, but when the tank man was told off to build a tank, all he knew about it was the fitting and applying of tank braces, and that's how I first came to know a "specialist."

It is poor policy for any railroad to turn out nothing but specialized apprentices, or to make handy-men out of them, for if by their methods they fail to make mechanics then it is time to go back to the old days and start in as helper, when you "sank or swam" on your own initiative.

JOSEPH SMITH.

Letter on Apprentices Draws Fire

DECATUR, ILL.

TO THE EDITOR:

This letter is in reply to R. R. Howarth's article in the January *Railway Mechanical Engineer,* entitled "Too Many Apprentices."

Mr. Howarth states that the present system of apprentice training is bunk. There are many systems of apprentice training. Which one is bunk, or is Mr. Howarth familiar with all of them and are they all bunk? What is bunk? No subject can be taught by plainly stating a series of dry facts. These facts must be dressed up to make them digestible.

True, the antiquated systems formerly in use of having a group of machinist apprentices sit in class and copy blue prints under the guise of studying mechanical drawing is bunk. Is elementary shop mathematics bunk? Is it bunk to demonstrate the theories of turning tapers, screw threads, gearing, levers, valve setting, laying out shoes and wedges, and other subjects too numerous to mention? If so, bunk is being taught. Interstate Commerce Commission rules are also bunk, we suppose. To learn to sketch is more bunk!

As to becoming specialists, the charge is a half truth. Many must, by the order of things in all walks of life, remain cogs in a wheel. All bank clerks cannot become bank presidents, all soldiers do not eventually become generals, and all mechanics certainly do not become master mechanics, or superintendents of motive power. Mr. Howarth suggests training fully only those who will eventually be called upwards. How does he select them? Has he a system of foretelling just at what stage or for what reason various promising young men will be weighed in the balances and found wanting? Mr. Howarth says the supervisors are specialists. They become specialists, of course, but are not the vast majority all-around men originally? Make them all specialists? Can we shut down the shop because the man who runs the shoe-and-wedge planer has gone to a funeral, or because the valve setter's wife is sick? Or, do we have two or three sets of extra specialists who obligingly appear to fill in for such emergencies?

A surgeon, according to Mr. Howarth's logic, need not study medicine, but simply learn the mechanics of removing the appendix.

As regards training too many apprentices, this company, with a 5-to-1 ratio, takes care of its graduates without much difficulty.

The writer has worked for several different Class I carriers and, outside of one system, there are no technical men in supervisory positions outside of the mechanical engineer's office forces.

Just what does an engineering graduate possess that enables him to step, as Mr. Howarth suggests, from an office to a supervisory capacity in the shop? What natural faculty has this technical gentleman which enables him to assimilate at a glance all the details which an equally intelligent practical man requires years to master?

This is not an attack on the college man. The writer has had some college training himself, yet he has found that his practical training far outweighs his classroom work in real value. While the practical man is regretting his lack of technical training, the technical man, who is not a bluffer, will cheerfully admit a desire for a fuller knowledge of practical things. As for a man who has all of both, there "ain't no such animal."

The specialist has his place, of course, and, in an industrial plant, which is on a production basis, he seems to have found his notch. But a railroad repair shop is not ready from any point of view for the lathe hand, the planer hand, the drill-press hand, the handy man on the floor, etc. On top of this condition, we have to hear some young "buck" fresh from college lament the fact that the real old-time genuine mechanic who "knows his stuff" is no longer to be had. The technical man can run a shop full of mechanics trained to go ahead on their own initiative, but let him try it on a shop full of specialists who, when taken out of their routine, ask him what to do next.

E. B. BAKER,
Supervisor of Apprentices, Wabash

Floating Bushings—Drilled or Grooved?

GREENVILLE, PA.

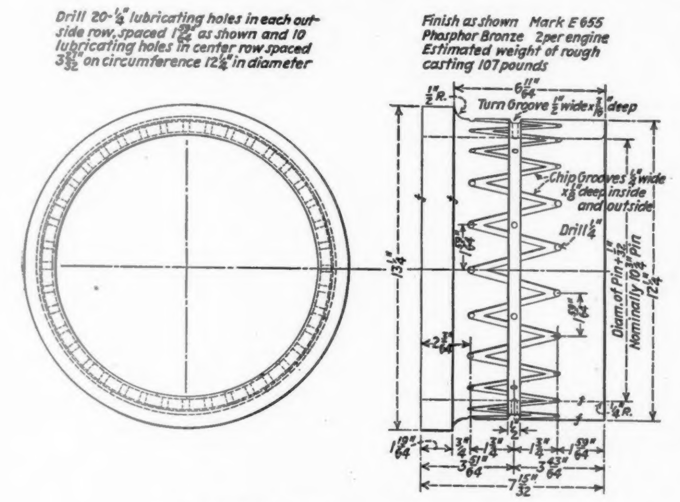
TO THE EDITOR:

On page 89 of the February issue "Supervisor" asks concerning the relative merits of drilled and grooved floating bushings and those in which the lubricating holes have been drilled and countersunk. The writer has had experience with both types of bushings and finds the drilled and countersunk bushing to be the superior type.

The first class of engines on the Bessemer & Lake Erie to which experimental bushings were applied was a Santa Fe type having 30-in. by 32-in. cylinders with 81,600 lb. tractive force. The main side-rod bearing was 10¾ in. inside diameter and the eye of the rod was 13¼ in. diameter. The stationary cast-steel bushing had ½-in. walls and the floating bushing was nominally ¾ in. thick.

The first experimental grooved floating bushing was of bronze and had one center circumferential row of ten ¼-in. grease holes and two outside circumferential rows of 20 grease holes per row, ¼ in. in diameter, spaced 1⅞ in. on the outside circumference staggered, and connected inside and outside with zigzag grease

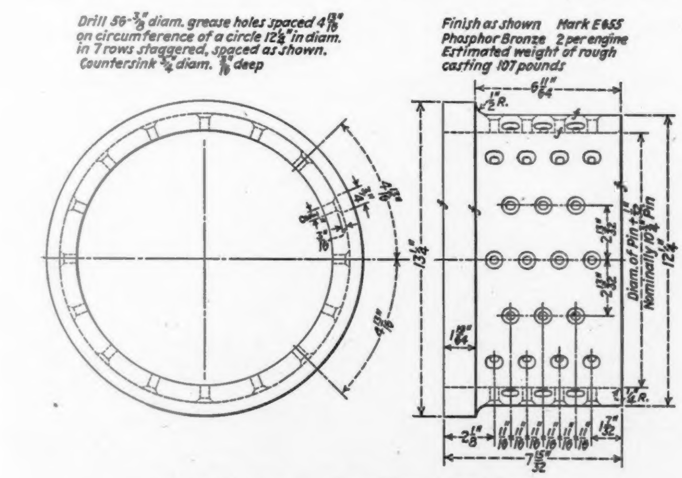
grooves. The center circumferential row and zigzag grease grooves were connected, on the outside face of the bushing, by a machined circumferential grove ½ in. wide and 3/16 in. deep. In this type of bushing it was necessary to drill 50 ¼-in. holes with a single-spindle drill and then to chip the zigzag grooves. This type of



The drilled and grooved bushing

bearing was very unsatisfactory in service because the bushing broke along the chipped grooves.

It was next decided to experiment with floating bushings having several parallel circumferential rows of ⅜-in. grease holes, staggered, and countersunk on the outside face of the bushing. Four types of bushings were designed, all having the same wall thickness and the same number of circumferential rows, but each having a dif-



The drilled and countersunk bushing

ferent number of grease holes. These had 180, 140, 72 and 56 holes, respectively.

In order to give a comparative test, several Santa Fe type engines were equipped with one type of bushing on the right pins and another type on the left pins. After the actual service test had lasted one year the following average mileage was shown for the various types of bushings: Zigzag grease grooves with 50 holes, 24,902 miles; 180 ⅜-in. holes, 23,565 miles; 140 ⅜-in. holes, 20,041 miles; 72⅜-in. holes, 25,158 miles, and 56 ⅜-in. holes, 28,640 miles.

No further attempt was made to reduce the number of lubricating holes and the bushing having 56 ⅜-in. holes, staggered, in seven parallel circumferential rows, countersunk ¾ in. diameter and 3/16 in. deep on the outside face, was adopted as standard on this class of locomotive. From the results of these experiments it was decided that in future installations the number of ⅜-in. lubricating holes would be based on an average of one hole per 4.3 sq. in. of bearing surface, measured on the outside circumference of the floating bushing. This approximate area is also working satisfactorily on heavier power. In actual practice this area varies slightly in order to obtain an even distribution of holes.

G. CHARLES HOEY.

Older Seat Designs Now Improved

CHICAGO, ILL.

TO THE EDITOR:

The discussion in the editorial on coach seating facilities which appears on page 87 of the February *Railway Mechanical Engineer,* outlines a situation that confronts eastern roads more than our western roads as the western roads have stayed with reclining chairs for the use of passengers who do not care to ride in Pullmans. In fact, there are many passengers who prefer to ride in cars having reclining chairs rather than in Pullman cars.

So far as coaches and smokers are concerned, it is hard to improve on the walkover type of seat, and, with the usual present-day passenger travel, one or two persons usually enjoy the comfort of two of these seats.

In the past few years, improvements have been made in the recliners now used in chair cars as well as in the walkover seats for coaches and smokers. The seating space of the recliners has been increased, cushions made soft with double coil-spring construction, backs made more comfortable and armrests upholstered. This also holds true of the walkover seats for coaches and smokers.

The advent of motor-bus travel has introduced a few designs of seat construction, one of which is commonly called the bucket-type seat, which, for short trips, will no doubt prove satisfactory, but I question if this will prove popular for long travel. Their construction, however, has not yet been made sturdy enough to adapt them to railway passenger travel.

I am afraid that the use of this type of seat for railway passenger cars is just a fad. What comfort there is in them can readily be embodied in the present recliners and walkover seats which are built with sturdy operating parts, are based on long years of experience in design and are made to last.

A satisfactory spacing of recliners in chair cars that will provide ample room for passengers is 3-ft. 6½-in. centers. The walkover seat in coaches and smokers can be spaced at 3-ft. centers and provide plenty of room.

F. A. ISAACSON,
Engineer of Car Construction, Atchison, Topeka & Santa Fe.

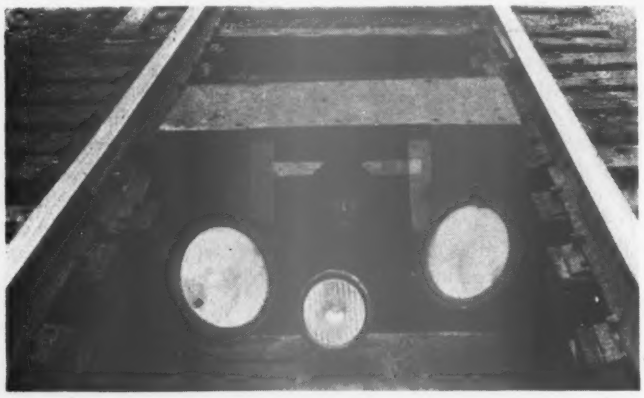
THE RAILROADS making up the New York Central Lines retired on pension in the past calendar year 737 employees, including 101 who were retired at their own request, having reached the age of 65, after 40 years of service.

The average of the pensions granted in 1929 was $771.84; in the year 1910, the average was $275. There are now on the rolls 5,206 persons to whom the payments during 1929 amounted to $2,883,631. It is estimated that the sum of $23,036,000 will be required to pay to termination the 4,682 pensions in effect at the beginning of 1930.

With the
Car Foremen and Inspectors

Underneath Inspection of Cars in Motion

AT the approach to the eastbound hump of the Juniata scales in the Pennsylvania yards at Altoona, Pa., has been installed an inspection pit so designed that an underneath examination of freight cars while in motion can be made without interference with the normal movement of the cars over the hump.



The pit is equipped with flood lights for underneath inspection as the car approaches and leaves the inspector's view

This pit presents an innovation in railroad practice in that an inspector so located is able to detect practically all defects that are not visible upon ordinary ground inspection. In formulating the plan for this project the main objective was to install an intensive and thorough underneath inspection for the purpose of reducing the number of train accidents and to assist in the elimination of other causes which might contribute toward train delay. From the beginning of the operation of the pit it was apparent that the added inspection was producing the hoped for results. Cracked arch bars, bent and cracked center sills, loose wheels and other defects not visible upon ordinary yard ground inspection were noted.

In the construction of the pit considerable stress was laid on the necessity of building the project in such a way that sufficient safeguards would be thrown around the pit to make the job safe for the inspector. Due to its being an experimental arrangement, however, careful consideration was given to the question of erecting the project in the most economical manner consistent with safety. Wherever possible scrap material was used and the entire job done at as reasonable a cost as was possible. As a result the actual cost of building was kept down to a very low figure.

Placed on Elevation

The pit is located in the bank of the hump, thus permitting the inspector to pass from the side of the bank directly into the pit. The passageway is constructed of cribbed 12-in. by 12-in. timbers, and the entrance is 5 ft. wide, 5 ft. 8 in. high and 10 ft. long. In order to provide room for the steel housing between the rails it was necessary to cut the ties to lengths of 2 ft. 6 in. and then spike them to the top of the cribbing that houses the pit. The shortening of these ties permitted an ample opening of 4 ft. 1 in. between the rails in which the housing was placed, with the roof sheet 1 in. below the top of the rail. Openings, which face up and down the track to provide a means for the inspection of the under parts of the car, are placed in the sides of the housing. A sliding glass, 12 in. by 17 in., of the shatter-proof type is installed in each of these openings to permit any falling object to glance off readily, preventing damage. With a sheet of steel 20 in. in length overhead and the use of the protected opening for vision, adequate provision has been made for the safety of the inspector without detracting from his effectiveness. The sliding glass is closed only when cars are not passing overhead to prevent rain and snow from entering the inspection pit.

The question of ample lighting facilities was thoroughly investigated, and it was decided that it would be necessary to provide three lights in each direction to light up properly the underneath portion of the cars as they passed over the pit. For this reason two floodlights of 200 watts capacity each were placed in a stationary position, one on each side of the pit. The third light, a portable one of 100 watts capacity, similar in power to an ordinary automobile headlight, was placed in the center of the pit. The beam of this light may be directed toward any part underneath the car.

Defective cars are located in the yards by whitewash sprayed on the rear truck by the inspector

One Inspector on Each Trick

The force required to operate the pit on a 24-hour basis consists of one inspector for each eight-hour trick. By the use of a stool, which is raised to permit the car inspector to view the car trucks at almost the level of the road bed, it is possible first to inspect the front portion underneath the car and then, by turning

on the stool quickly, view the rear portion as it passes over the pit.

When the inspector observes a defect which does not require shopping of the car, but which can be repaired in the yard, he marks the car on the south side of the rear truck by the use of a whitewash spraying device. Cars on which defects are noted that require shopping are sprayed with a similar whitewash spraying device on the north side of the rear trucks. As soon as such a defect is noted the inspector presses a pushbutton which operates a bell in the conductor's room at the apex of the hump, located about 300 ft. from the inspection pit. This warning bell indicates to the conductor that a shop car is to be cut out for the shop track, thus giving him sufficient time to notify all concerned to look for the spray mark on the north side of a truck so that the car can be shunted to the shop track.

The whitewash spraying device consists of two tanks, 12 in. by 24 in., one tank for each spraying nozzle located on each side of the track. An air line is connected to the two tanks and, when a defect is observed, the inspector applies the air to the one tank, depending upon which side of the car is to be marked, and the whitewash is forced to a nozzle extending 18 in. above the ground. The whitewash spraying nozzles are located about 8 ft. east of the inspection pit so that the inspector in the pit will have ample time to spray the truck of the car, which is moving over the hump at a speed of 2 m.p.h. To prevent the whitewash pipe lines

Entrance to the pit is through a passageway built in the side of the hump elevation

from freezing in cold weather an auxiliary tank and a three-way valve are used with each main tank to drain the whitewash from the spraying lines.

To insure attention for the cars sprayed on the south side of the trucks the inspector in the pit makes a note of the defect. He cannot give the car number on which the defect has been noted, but the inspectors in the yard are required to keep a record of the defects repaired, giving the car numbers. This report is then checked against the inspector's report for each 24-hour period. The cars received in the car-repair shop with whitewash marks on the north side of the truck also have the repairs recorded and this record is checked against the inspector's record.

Results

The results of a 30-day check revealed a total of 348,436 cars inspected in that period. Out of an average number of 1,280 cars per day receiving this examination, a daily average of 14.4 cars were found with underneath defects. A total number of 434 cars were found defective in the 30-day period and 76 per cent of these cars were those with defects not visible upon ordinary yard ground inspection. Among the various cars inspected, 31 were found with the arch bars cracked inside, 26 with wheel defects and 20 with

Portions of the car not seen from the ground receive thorough inspection

bent or broken center sills, all of which could not have been seen by ordinary yard inspection.

It has been noticed since the inception of this underneath examination that there has been a general tightening up of inspection in the receiving yards, fewer cotter keys have been found missing and more attention is paid to the underneath portion of cars.

Decisions of Arbitration Cases

(The Arbitration Committee of the A.R.A. Mechanical Division is called upon to render decisions on a large number of questions and controversies which are submitted from time to time. As these matters are of interest not only to railroad officers but also to car inspectors and others, the Railway Mechanical Engineer will print abstracts of decisions as rendered.)

New Wheels Removed in Three Days for Handling-Line Defects

On November 21, 1927, the Denver & Rio Grande Western applied a pair of new wheels to U. R. T. car 82496, on account of one wheel having a broken rim and the mate wheel being worn through the chill, and rendered a bill against the Union Refrigerator Transit Company for $20.19 to cover the difference between the A. R. A. value of the new wheels applied and the scrap

wheels removed. Three days later the D. & R. G. W. removed this identical pair of wheels on account of a cut journal, both wheels being O. K., and replaced them with a pair of second-hand wheels cast in October, 1920, the change being reported to the car owners without charge or credit. In view of the fact that the new wheels applied to car No. 82496 on November 21, 1927, were removed by the same company and replaced with second-hand wheels seven years old within thirty days on account of axle defects which did not affect the service value of the wheel (and for which the American Railway Association Rules hold handling line solely responsible), it was the contention of the Union Refrigerator Transit Company that the D. & R. G. W. should reduce its charge for the wheels used on November 21 to $6.30, which represents the A.R.A. value of the wheels actually taken from their stock to repair the car. The owner based its claim on the provisions of Arbitration Case No. 1371 and not on any provisions of the rules then in effect. The D. & R. G. W. contended that, inasmuch as revised Rule 98 does not authorize a charge against the car owner for betterments applied on account of defects in wheels or axles for which handling line is responsible, the revision in this rule, effective August 1, 1926, automatically abrogates the decision in Arbitration Case No. 1371, and that its charge for new wheels is therefore correct as rendered. The repairing line further contended that the charge made against the Union Refrigerator Transit Company was in accordance with schedule prices and credits shown in A. R. A. Rules 101 and 107. When the new wheels were removed on account of a cut journal no material or labor charge was made for this repair. The wheels removed were second-hand having been in service, and for that reason the U. R. T. Company was not allowed credit for the wheels removed.

In rendering a decision, the Arbitration Committee stated, "This case is parallel to that under Case No. 1606. Same decision applies."—*Case No. 1625-Denver & Rio Grande Western vs. Union Refrigerator Transit Company.*

[EDITOR'S NOTE—The decision as rendered under Arbitration Case No. 1606 is as follows: "Under present Rule 98 it is not permissible to charge car owner for difference in value between new wheels applied and second-hand wheels removed account delivering line defects. Therefore, it would be inconsistent to allow credit at value new for second-hand wheels removed in the case at issue, notwithstanding these wheels were new when applied a short time previously. The rules do not recognize any difference in the value of cast-iron wheels, as second-hand, in so far as the question of length of service or age is concerned. The contention of car owner is not sustained."

Wrong Repairs—Joint Evidence Conclusive

On July 26, 1927, in connection with other repairs, the Terminal Railroad Association of St. Louis renewed draft timbers at A and B ends of Minneapolis & St. Louis car 5014. The M. & St. L. secured a joint evidence card for wrong draft timbers on the car and presented its claim to the Terminal Railroad Association of St. Louis, which declined to issue a defect card. The owner stated that the car was received home at Perry, Ia., on August 1, 1927, from the Chicago, Milwaukee & St. Paul and was delivered to the Chicago & North Western at Des Moines, Ia., on August 30, 1927. The car was received back from the C. & N. W. on August 31, 1927, and arrived at Minneapolis, Minn., on September 15, 1927, was delivered to the C. M. & St. P. on September 15, and received back from that railroad on September 22, 1927. Inspection of the car was made by the chief joint car inspector, Twin City Lines, September 28, 1927, and joint evidence card was furnished on account of wrong repairs. Correct repairs were made on September 28, 1927. The joint evidence and repairs to the car were made within the 90-day period after the first receipt of the car home. The repairing line stated that the repairs to the M. & St. L. car 5014 included the application of two draft timbers 5 in. by 9 in. by 8 ft. 4 in. at the A and B ends of the car. The joint evidence card presented by the owner, dated at Minneapolis, September 28, 1927, showed that the car was received at Minneapolis September 15, 1927, with two draft timbers 4¾ in. by 8¾ in. by 8 ft. 4 in. at the B end and two draft timbers 5 in. by 9 in. by 8 ft. at the A end instead of draft timbers 5½ in. by 8¾ in. by 8 ft. 2 in. The repairing line declined the joint evidence card because the dimensions of the draft timbers said to have been found in the car did not correspond with the dimensions of the timbers which it had originally applied and because the joint evidence card was not secured on the first receipt of the car home.

The following decision was submitted by the Arbitration Committee, "The joint evidence is sustained. The Terminal Railroad Association of St. Louis is responsible for the wrong repairs."—*Case No. 1626-Minneapolis and St. Louis vs. Terminal Railroad Association of St. Louis.*

Wheel with Diagonal Bore

On March 19, 1928, the Peoria & Pekin Union repaired Chicago, Rock Island & Pacific car 89384 at Peoria, Ill. Repairs made to handling-line defects, resulting from a derailment, included R. & L. 3 wheels with a cut journal, one Bettendorf truck side, a spring plank and two brake beams at the A end. The billing repair card was marked "No bill." Repairs that were made at the same time and shown as owner's defects were one pair of second-hand wheels, a second-hand axle, two journal bearings and two dust guards. These repairs were made at R. & L.4 on account of one wheel having a worn flange, one wheel being out of gage on account of not being bored true, the axle scrapped on account of journal length, the journal bearings and dust guards being renewed on account of the wheel exchange. The Rock Island took exception to the charge because it contended that second-hand credit should have been allowed for the wheel not bored true instead of the scrap credit allowed by the Peoria & Pekin Union. The owner further contended that the A.R.A. rules do not authorize any charge for the renewal of wheels on account of crooked or diagonal bore whether the wheels are changed for this reason, cut journal, bent axle or the condition of the mate wheel, basing its contention on Arbitration Decision No. 1580. The repairing line contended that it was impossible for it to remount the wheel on another axle and use it again under another car, because the wheel was improperly bored and was valuable only as scrap material.

The Arbitration Committee in rendering a decision stated that "The handling line is responsible for the wheel in question. Decision No. 1580 applies."—*Case No. 1627—Chicago, Rock Island & Pacific vs. Peoria & Pekin Union.*

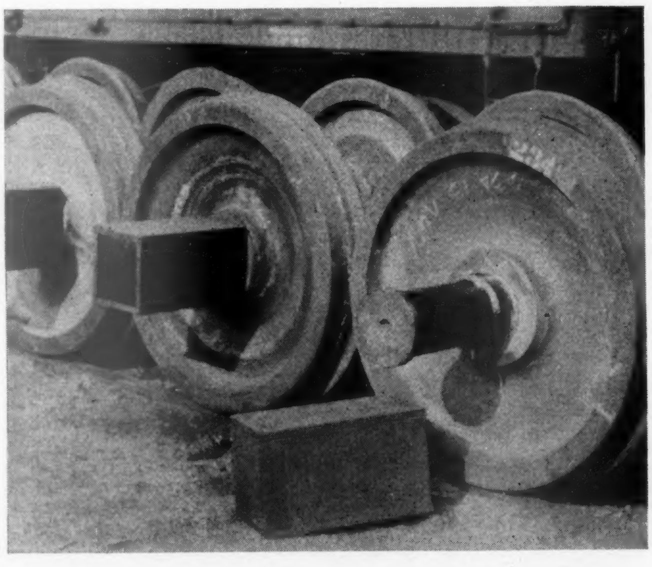
Cars Damaged in Switching

On April 19, 1927, the Pennsylvania repaired Maine Central box car 9678 at Conway, Pa., on account of damaged end posts, lining, siding, etc., which was caused by the shifting of a load of brick, resulting from an impact during switching. The car was not involved in any derailment, cornering, side-swiping or telescoping, or any other unfair conditions as set forth in Rule 32. The Pennsylvania stated that the car was being classified over the hump with rider protection for track No. 420 and that it was led by two empty hopper cars for track No. 430. The two empty hoppers stalled before clearing track No. 420 and the M. C. car, loaded with bricks, was switched to the track occupied by the two empty hoppers to prevent cornering or side-swiping. In making the coupling the load shifted and caused the damage to the end of the car. The Pennsylvania contended that since the car was not derailed, cornered or side-swiped the owner was responsible as per Rule 32. The Maine Central took exception to the Pennsylvania's bill covering the repairs to this car, contending that the handling line was responsible because the emergency did not constitute a regular switching movement.

The Arbitration Committee rendered the following decision: "Car was not subjected to any of the unfair conditions of Rule 32. Owner is responsible."—*Case No. 1628—Maine Central vs. Pennsylvania.*

Protecting Passenger-Car Journals

MANY of the investigations that have been made into the causes of hot boxes have traced the cause

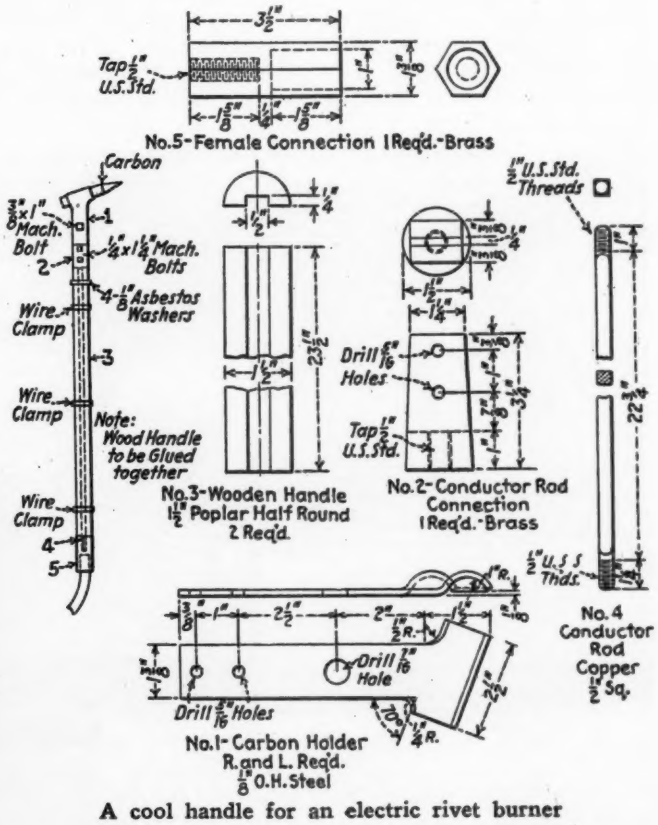


Wooden covers for passenger-car journals

to grit and dirt that has worked into the journal bearings because there was dirt on the journals when the wheels were put under the cars. At the Broadway coach yards of the Nickel Plate Road in Cleveland, Ohio, a number of cars are maintained that are used on fast runs and in special service. In order that there may be on hand several pairs of coach wheels in perfect condition the car foreman at that point devised the scheme for protecting the journals while the wheels are in storage which is shown in the illustration. When the wheels are received from the wheel shop the journals are carefully cleaned and wiped, then coated with grease and finally covered with the wood box-like device which is shown. This is made so that it fits snugly over the wheel seat, yet the distance across the outside corners of the box is not greater than the diameter of the wheel hub. This construction, with the grease coating, keeps out the dust and dirt.

A Holder for an Electric Burner

THE intense heat which radiates from the carbon point of an electric rivet burner makes it desirable to furnish the holder with a well insulated handle such as is shown in the drawing. This holder consists of two



A cool handle for an electric rivet burner

pieces of half round wood that are slotted, as shown, to form a channel for a $\frac{1}{2}$-in, square copper conductor. Two $\frac{1}{8}$-in. O. H. steel grips, which hold the carbon tip, are bolted to the wooden handle by means of $\frac{1}{4}$-in. machine bolts. The copper conductor, which is threaded at both ends for connecting it to the electric circuit and the carbon tip, is securely held in the handle, the latter being glued together, reinforced by wire clamps and insulated with asbestos washers.

F. B. Winslow, auditor of the Tennessee Coal, Iron & Railroad Company, Birmingham, Ala., is another recruit model builder. Mr. Winslow has turned out a hand-made locomotive, which, although it is only 40 in. long overall, weighs 27 lbs., has a cylinder bore of only 11/16 in. and moves under its own steam. It is a miniature Pacific type oil-burner, built to a scale of one-half inch to the foot. It requires a track gage of $2\frac{3}{4}$ in., has $3\frac{1}{2}$-in. drivers, $1\frac{1}{4}$-in. cylinder stroke, and its tubular boiler allows a steam pressure of 100 lb. to the square inch. Its tender has a capacity of a quart and a half of water and fuel.

Do You Know

Why Some Cars Ride Hard?

By R. R. Howarth

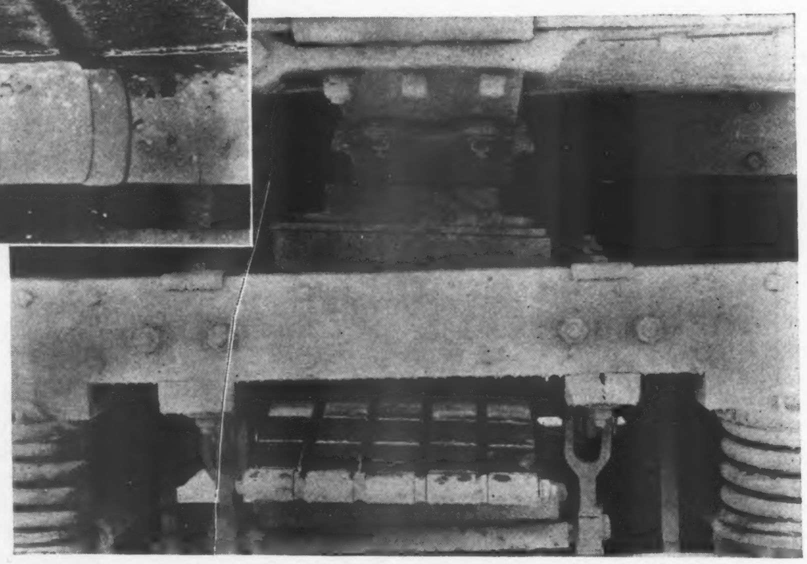
DID you ever notice that some passenger cars provide such a comfortable means of riding that the passenger can enjoy every moment of his trip whether he is reading, sleeping, dining or just doing nothing except looking out of the window? On the other hand, once in a while we run up against a car that seems to sway from side to side, to vibrate up and down as though it had a weak back or, if a diner, to make it almost impossible to keep the dishes on the table, let alone get anything from the plate to your mouth.

Not long ago I had occasion to ride a train on a certain railroad that is not only the pride of that road's passenger fleet but is extensively advertised because of its finely appointed equipment, comfortable riding and fast service. After several hours of riding lunch time came and I went into the diner and was seated at a table opposite another traveler. I noticed that the car seemed to vibrate considerably and casually remarked to the other man that we must be passing over some pretty rough track.

"No," he said, "there is no rough track on this road. There are other reasons why this car rides hard."

"There are three pairs of wheels in each truck under these cars and the weight of the car is distributed through bolsters which rest on four elliptic springs which are supported in the truck frame by four U-shaped hangers. The distribution of weight on the journals is further cared for by four coil springs which are located between the side frame of the truck and the equalizing bars. Each section of the equalizing bar extends from the journal box of the center wheel to the journal box of an outer pair of wheels. There is an arch support connected to the two bolsters on each side of the truck to which is attached a side bearing which cares for tipping motions of the car when going around curves. In the center of the truck is a center plate which engages with a center plate on the body of the car and through which a large center pin is inserted.

Left—Two defective center sections of elliptic springs in a four-wheel truck caused the breakage of the top spring-seat casting



Right—In this case a defective spring permitted the truck bolster to tip—Here also is a case of insufficient side-bearing clearance

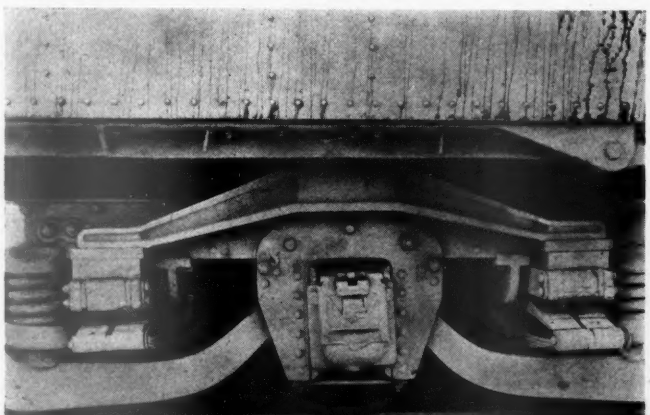
"One of the most common causes for hard riding of passenger cars is improper side bearing clearance. If there is no side bearing clearance the car body is a dead weight on the truck bolster springs and when a car is going around a curve the car body cannot lean toward the inside of the curve but must compress all of the springs on the side of the truck at the inside of the curve and then the truck vibration is all conveyed to the car body. On the other hand if there is excessive side-bearing clearance the car body will roll violently when

passing over rail joints or when going around curves. On the majority of side bearings approximately 1/16-in. clearance should be maintained between the side bearing proper and the side-bearing wearing plate. If this clearance is maintained it is impossible for any vibration to be transmitted from the truck bolster to the car body.

"Another common cause for hard riding of cars is that the elliptic springs become weakened by age or by having been improperly heat treated when manufactured so that the sections meet under compression when the cars pass over railroad crossings or track joints. When this occurs at high speed a decided shock is transmitted to the car body through the center plates or side bearings, it being impossible to maintain a correct side-bearing clearance with a weak elliptic spring in the truck. Temporary relief may be afforded for this condition between terminals by applying a wedge shaped piece of wood of sufficient thickness at each end of the elliptic springs which will prevent their total collapse. On arrival of the car at the terminal a new spring should be applied.

"Quite often, on cars such as dining cars in which the weight is unevenly distributed, it will be found that one of the springs will be compressed more than the others, so that it will tilt the spring and cause the car to ride with a choppy motion. To overcome this, the spring which is not receiving its share of the weight should be forced to carry more weight by placing shims between the spring seats and the spring hangers, but under no circumstances should the spring which is overloaded be raised.

"The truck center plates are generally secured to the truck bolster with bolts and occasionally these bolts become loose, permitting the center plate to slide around in the bolster. When this occurs a rotating sensation is felt as the center plate slips from bolt to bolt. The only remedy for this is to tighten the bolts properly. It will be found that this movement of the center plate causes the bolts to become badly worn and in some cases



The elliptic springs shown at the left on this six-wheel truck caused the truck bolster to be thrown out of position—The journal box is out of alinement in the truck pedestal

broken. Such bolts should be replaced promptly with others.

"The cross bolsters are adjacent to cross truck members commonly known as truck transoms. At each of the four outer corners of the truck bolsters and at a corresponding location on the truck transoms hardened steel chafing plates are applied. Normally, there is approximately ⅛ in. clearance between these chafing plates to permit lateral motion of the truck bolsters. If there is no clearance at these chafing plates when the car is going around curves the truck bolsters will bind and then slip, causing the car body to jerk violently. If the clearance is excessive at these points the bolsters will rock back and forth when the car is in motion, which is one of the principal causes for lengthwise rocking movements of the car and the sensation is extremely disagreeable to passengers. There is no temporary relief that can be afforded for this condition. Adjustments must be made to the chafing-plate fillers so that they will have the proper clearance.

"On modern trucks there are two pairs of brake beams for each pair of wheels, one engaging each side of the wheel. These beams are attached to the truck frame by means of short hangers which have a pin through a hole in the brake-beam head and hanger and a pin through a similar arrangement in the truck frame. If these pins or the pin holes become worn, noticeable vertical vibration is transmitted to the car when the brake is applied. The brake shoes sliding on the wheels cause the brake hangers to move up and down rapidly which causes this vibration. Temporary relief can be given by applying larger pins and at the first opportunity hardened bushings should be applied to the pin holes in the brake beam heads and also in the truck frame.

"The coil springs which support the truck frame on the equalizer bar are a constant source of annoyance. There must generally be about 2½ in. clearance between the top of the equalizer bar and the bottom of the truck frame at the pedestal jaw. This clearance must be maintained by adjustments of the equalizer coil springs. If there is no clearance, at these points, any slight defect in the track conditions will cause the truck frame to strike the equalizer a sharp blow which will be transmitted to the car body as a vertical shock. If there are a series of such shocks, such as would develop in crossing a multiple railroad crossing at high speed, so much vibration would be set up in the car body that the train would proceed several miles before this vibration finally ceased. If the coil springs have not acquired a permanent set, immediate relief can be secured by shimming the springs to the extent required and raising the truck side frame to secure the necessary clearance. If the spring has acquired a permanent set a new spring will have to be applied.

"The equalizer bearing on the top of the journal box and the bearing face of the equalizer become worn from a horizontal plane. This results in a combination of conditions in which the journal box is tipped, the equalizer coil springs are not standing vertically and the equalizer bars have considerable end play. This causes a rocking motion to the car body which is irritating to the passengers. The application of new journal boxes will give temporary relief but permanent relief will not be secured until the equalizer bars are refaced.

"All of the conditions mentioned are usually found on cars which have been in service for a considerable length of time. The car we are riding in is a new car and has not been in service long enough to acquire defects of this kind except possibly that of improper side-bearing clearance. I assume, therefore, that the trouble on this particular car is not in the truck itself nor in the springs, but is due to improper wheel conditions.

"If a car is moved for any distance with the brakes tightly set, slid flat wheels will develop. This is usually distinguished by a thumping and pounding and is easily found and remedied quickly at the terminal by removing the wheels, placing them in a lathe and turn-

ing off sufficient metal to restore the concentricity of the wheel.

"You will notice that the vibration on this car is constant and more noticeable at a speed around 35 miles an hour than at a higher speed. This is usually associated with a wheel that is not truly round. The wheels which are under this car are steel wheels, forged from a small block of steel in a large forging machine and rolled to shape in large rolls while hot. It is quite likely that in cooling they became slightly out of round and that condition was not detected by the inspector. About the only way to determine whether or not wheels are round is to remove them and place in a wheel lathe for checking. If wheels are then found out of round sufficient metal is cut off to restore concentricity."

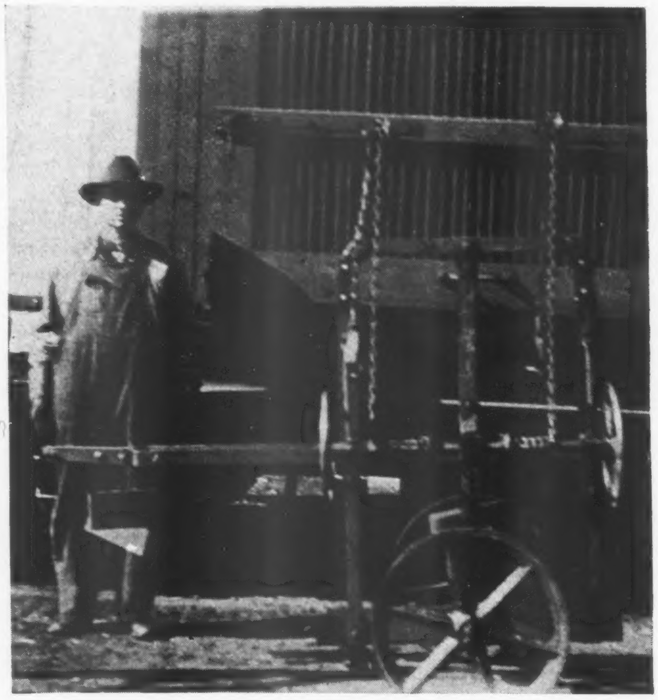
"It would seem, then," I said, "that most of the rough riding passenger cars could be smoothed up if they were given the proper attention at terminals."

"Yes, the price of comfort to travelers is careful work on the part of car inspectors and the renewal of defective parts before they get bad enough to cause discomfort to passengers. On a high-class train like this there is no excuse for rough-riding cars and I am not so sure that it might not be a good idea for the railroads to make their general car foremen ride trains more often and hear what some of the passengers think of careless work on the part of inspectors and repairmen. When a traveler rides on the railroad he has a right to expect greater comfort than on any other form of transportation on land, and rough riding cars turn away many otherwise good customers."

Hanging Car Doors

In the illustration is shown a device developed on the Louisville & Nashville for facilitating the hanging of car doors. The device is equipped with two 24-inch wheels, 30 in. apart which are supported by a 1½-in. axle, offset in such a manner as to allow the bottom of the door to set lower than the center of the wheels while being moved from the shop to the repair track. This offset is 7 in. wide by 6 in. deep, and is located 7 in. from the longitudinal center line of the machine. A 4-in. guide wheel is attached to the front of a channel in which the door rides while in transit. This channel is constructed of 5-in. by 2-in. by ¼-in. angle-irons, 3 ft. long. It is fitted in the offset axle and is rigidly bolted at that point and to two vertical arms at each end of the channel, one on each side, which are 2-in. by ½-in. bars, 5 ft. long. These vertical arms, spaced 6 in. apart and bolted to the channel and to the divided tongue of the device, form guides for holding the door vertical when loaded. The channel is fitted with 2-in. rollers, one at each end and one at the center, on which the door rolls as it is being loaded. While the door is being moved from the shop to the rip track it is supported on these rollers and is rigidly secured between the vertical arms by wooden wedges. In this position, the door is centered on the device, one end extending a few feet to the rear of the truck while the other end extends forward to the end of the slot in the divided tongue.

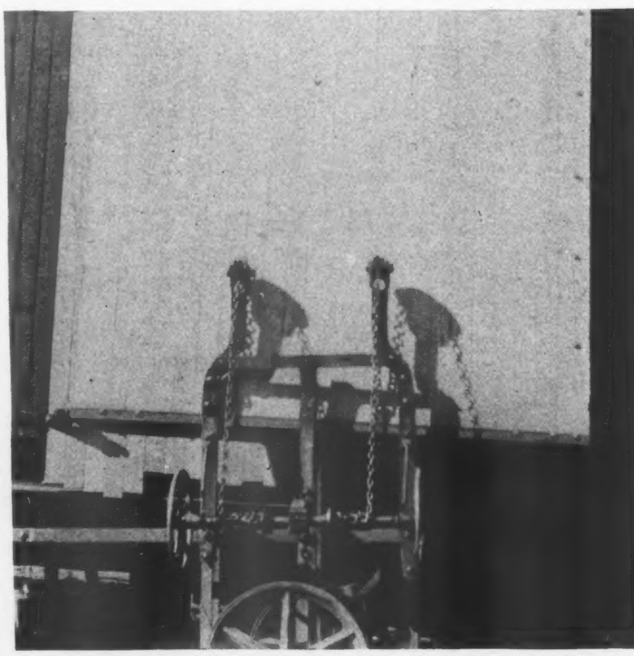
The winch used for raising the door sets over the long end of the off-set axle and is supported by two 2½-in. by ⅝-in. mast arms that are bolted to the loading channel and to the upright arms which support the door. These mast arms, 5 ft. 6 in. high, are spaced 30 in. apart and have 6-in. offsets at the upper ends which are shaped to hold 4-in. sheave wheels through which the lifting chains work. The winding shaft, 1½ in. in diameter, and 3 ft. long, is equipped with a 15-in. hand wheel on each end and a ratchet wheel in the center. The lifting



A device used for moving and hanging car doors

chains are 9 ft. long and are attached to the winding shaft by means of cuffs which are so constructed as to allow adjustments to be made in chain lengths.

When hanging the door the chains are lowered so that



A car door raised by the device preparatory to sliding it into position

hooks can be inserted under the lower edge of the door, which is resting on the rollers 2 in. off the floor of the supporting channel. As the door is raised it is easily steadied by two men who complete the operation by sliding it into position on the side of the car.

Indexing Chuck for Main Rod Brasses

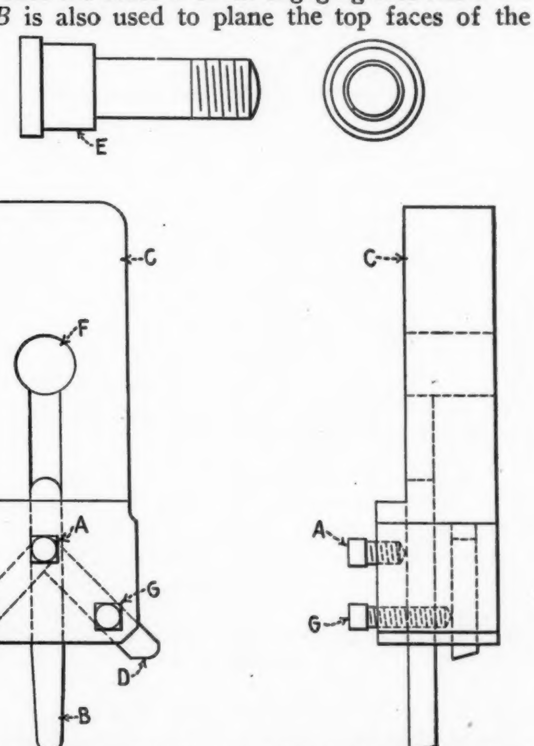
THE indexing chuck shown in the illustration is one which combines convenience and accuracy in holding and indexing main-rod brasses on heavy-duty machines when machining them to fit the fork of a main rod. The chuck can be mounted on a shaper or planer and is of such a size that it will accommodate all ordinary sizes of main-rod brasses.

The chuck is made up of a base *A* in which is fitted the taper shank of the face plate *B*. Hardened teeth on the face of this plate, against which the brasses bear, decrease the possibility of the brasses slipping while being machined. The front of the base has eight equally spaced radial slots into which fit the keys *C* that are attached to the back of the face plate. Eight stations provide for shaping the four channels for the main-rod fits and four chamfers for the strap clearances.

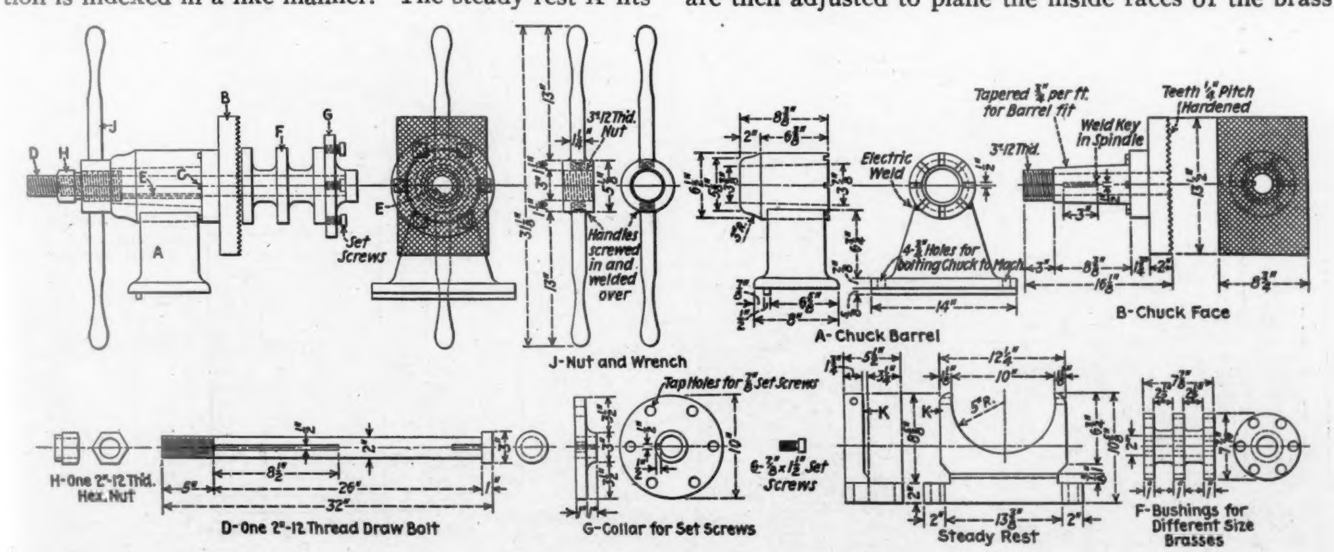
Through the center of the face plate and its shank passes a draw bolt *D*, 32 in. long. Key *E* prevents this bolt from turning in the shank of the face plate but permits end-wise movement as required for indexing. Mounted on the draw bolt is a bushing *F*, a number of varying sizes of which are needed to accommodate brasses having different size bores and lengths. They are grooved so as to reduce their weight. The collar *G*, fitted with six equally spaced set screws, is mounted and keyed to the draw bolt, adjacent to the bushing which holds the brass.

When a brass is placed on a bushing the draw-bolt nut *H* and the six set screws are tightened, thus securely holding the brass against the face plate. By sufficiently unscrewing the nut *J* the face plate with the brasses may be moved forward far enough to disengage the keys *C*. The face plate can be revolved to the next position and the nut *J* retightened. Each succeeding position is indexed in a like manner. The steady rest *K* fits under and partially around the screw plate *G*, thus acting as an outboard bearing.

The machining of the brasses is facilitated by the use of the illustrated combination tool holder. When planing the bottom of the brass the set screw *A* is loosened and the tool bit *B* is lowered in the holder *C* far enough to face the brass without engaging tool bits *D-D*. Tool bit *B* is also used to plane the top faces of the flanges of the brass. After the flanges and the bottom of the brass are planed, tool bit *B* is released and pushed up in the holder *C*, out of sight. The tool bits *D-D* are then adjusted to plane the inside faces of the brass



The combination tool holder used with the indexing chuck

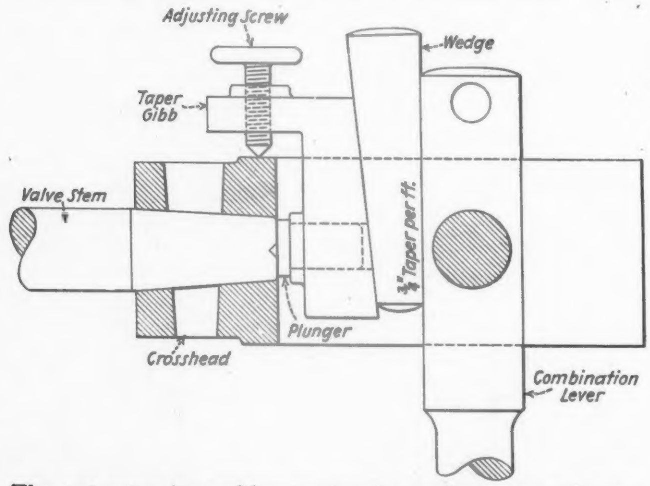


The main-rod-brass indexing chuck

flanges at one setting, no finish cut being required. Tool bits *D-D* are ½ in. square and 3½ in. long, while the tool bit *B* is ¾ in. square and 4½ in. long. The combination tool post, attached to the shaper tool clapper by means of the bolt *E* through the hole *F*, eliminates the necessity of changing the different tools for each succeeding operation connected with the machining of the main-rod brasses.

A Valve-Stem Extractor

The locomotive mechanic often encounters difficulty in cutting a valve stem from a valve crosshead because of the design of the valve stem, valve crosshead and combination lever which makes the end of the stem inaccessible, thus prohibiting the use of a hammer to loosen the stem in the crosshead. In the drawing is shown such an extractor which



The extractor in position to break a valve-stem and crosshead joint

does the job in a minimum time and makes it a comparatively simple operation. It consists of two tapered members, a wedge and a gib, the latter being *L*-shaped and equipped with a screw for height adjustment. A hole which serves as a well for a plunger extension is drilled near the bottom of the gib. The plungers used have heads of different lengths and thicknesses to suit the clearances between the inner faces of the crossheads and the combination levers as found on the various classes of locomotives.

In using the tool, the mechanic selects the necessary plunger and places it in the well of the gib. The gib is set with the head of the plunger against the end of the valve stem, in which position the gib is securely held by setting the adjusting screw. The combination lever is cut from the union link and allowed to hang in a vertical position. The wedge is then driven down between the gib and the combination lever, extracting the valve stem from the crosshead.

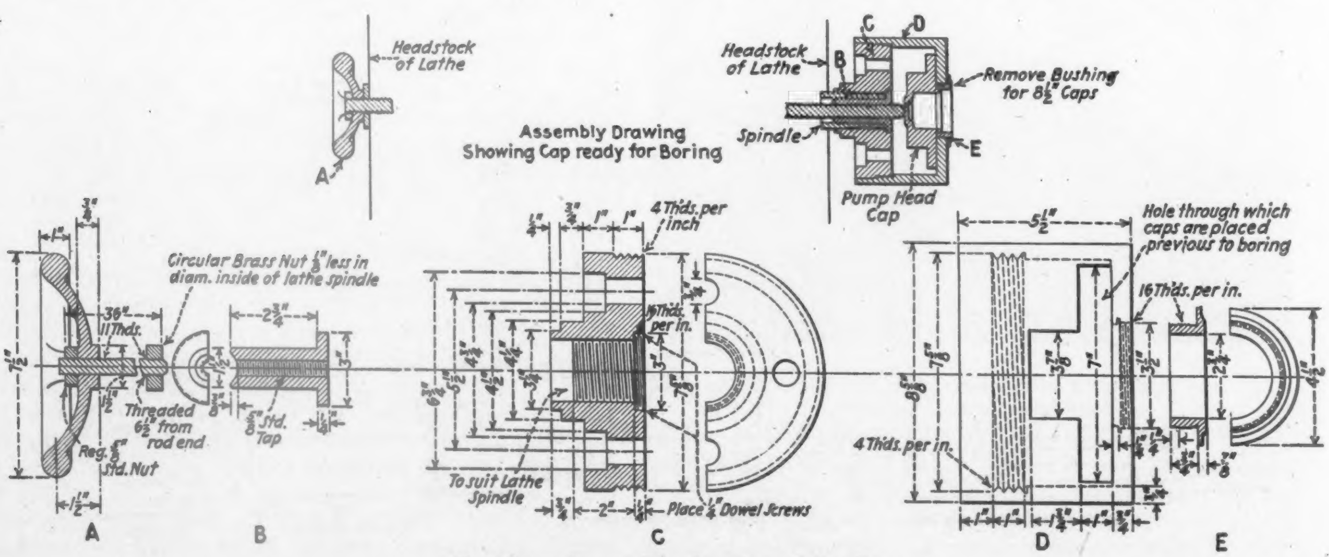
Boring Compressor Head-Caps

In boring caps for air-compressor heads difficulty is often experienced in boring them square with the finished face of the cap. This is due to the fact that the cap cannot be trued up in the lathe with a great degree of accuracy in a reasonable length of time because the cap is a rough casting and of such a shape that the chuck-jaw pressure is limited. Thus limited, the machine operator oftimes finds it difficult to turn out work of high quality unless he consumes an excessive amount of time in chucking up each cap to the point where he is assured that the bore will be absolutely square.

The drawing shows a jig that can be screwed onto the spindle of a lathe and which will permit the boring of these caps absolutely square with the finished face in a minimum length of time. That portion of the jig shown as *C* is an old dog plate on which is screwed the section *D* that served as a squaring face for the cap. The finished face of the cap is held flush against *D* by the screw *A* which is attached to the head stock, running through the spindle shaft as shown. A removable bushing, shown as *E*, is screwed into the jig when it is desired to bore 8½-in. pump caps but is removed when caps for 9½-in. air pump heads are to be machined.

When the jig is made and in place on the machine it is essential that it be faced off inside to insure a square surface for the machined face of the cap to rest against. This can be accomplished by the use of a hook tool.

To chuck a cap in readiness for boring it is only necessary to drop it through the slot cut in the jig and to run the pressure screw against it. The device auto-



Details and assembly drawing of the jig

matically trues up a cap and eliminates any semblance of chuck strain, thus insuring a perfect job with a minimum amount of effort in a short time.

A Valve Bushing Puller

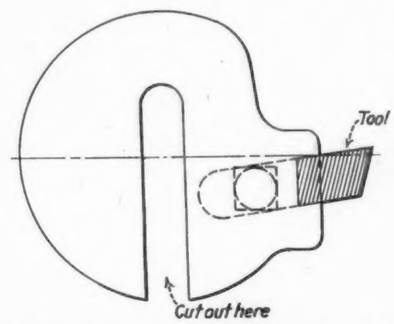
THE valve-bushing puller which is shown in the drawing is easily and quickly assembled and is estimated to develop a total pull of 35 tons with the use of a corner drill. The housing is composed of three pieces of steel tubing and two pieces of boiler plate, all of which are welded together. The plug with the taper threads, forming the left-hand bearing for the worm shaft, is screwed in permanently while the right-hand bearing has a hexagon end for removing, thus facilitating the application or the removal of the worm shaft and parts. The worm wheel shaft No. 7, the worm and shaft No. 1, and the special hexagon nut No. 8 are all made of scrap piston rod, while the pull rod, which is 6 ft. 6 in. long, is made of machinery steel.

When the bushing which is to be applied is set in place, the pull rod No. 11 is passed through the valve chamber with plate No. 13 (of proper diameter to suit the bushing) secure between the two 2-in standard hexagon nuts. To secure the pull rod in a position to operate, plate No. 12 and washer No. 9 are slipped over the threaded end of the rod and pulled tight against another valve bushing or against the face of the valve chamber by means of the special nut No. 8. The housing containing the worn and worm gear fit over the hexagon portion of the special nut No. 8, and when in that position it is held there by means of a 2-in. rod which is placed in the 2 1/16-in. hole shown at the bottom of the housing. This rod prevents both the housing and the air drill from revolving and eliminates the necessity of bolting any part of the device in place.

A Morse taper is provided on each end of the worm shaft for convenience in reversing the device in the absence of a reversible motor.

Spring Boring Bar and High-Duty Tool Post

THE tool post shown in the photograph having two screws to grip the tool, instead of one, can easily be made in any shop. The upper part of the



End view of spring-type boring bar—Tool held by set screw—Vertical slot gives necessary "spring" effect

tool post is threaded, and a block screwed on it, having holes for two tool-post screws, as shown. The illustration is self-explanatory and gives a clearer idea of the device than any description.

Details and assembly of the bushing puller

The spring-type boring bar eliminates chattering. The use of an overhung spring tool to eliminate chattering on planers and cylinder boring bars is quite common, but a spring tool is hardly adaptable to a lathe boring bar. The boring bar shown is cut out on one

Spring boring bar and high-duty tool post

side, and the end split, as shown in the drawing, to give a spring effect, and an ordinary Armstrong tool used. This bar has been tried out threading joints in the oil fields and found to possess considerable merit. By its use it is possible to cut the internal taper threads in much less time than when a plain boring bar is used for a threading-tool holder.

THE BOSTON & MAINE handled a train recently with 25 locomotives. Only one of the locomotives was in operation, however, the other 24 being loaded on flat cars. They were the narrow gage locomotives of the Boston, Revere Beach & Lynn, enroute to a blast furnace in Pennsylvania for melting.

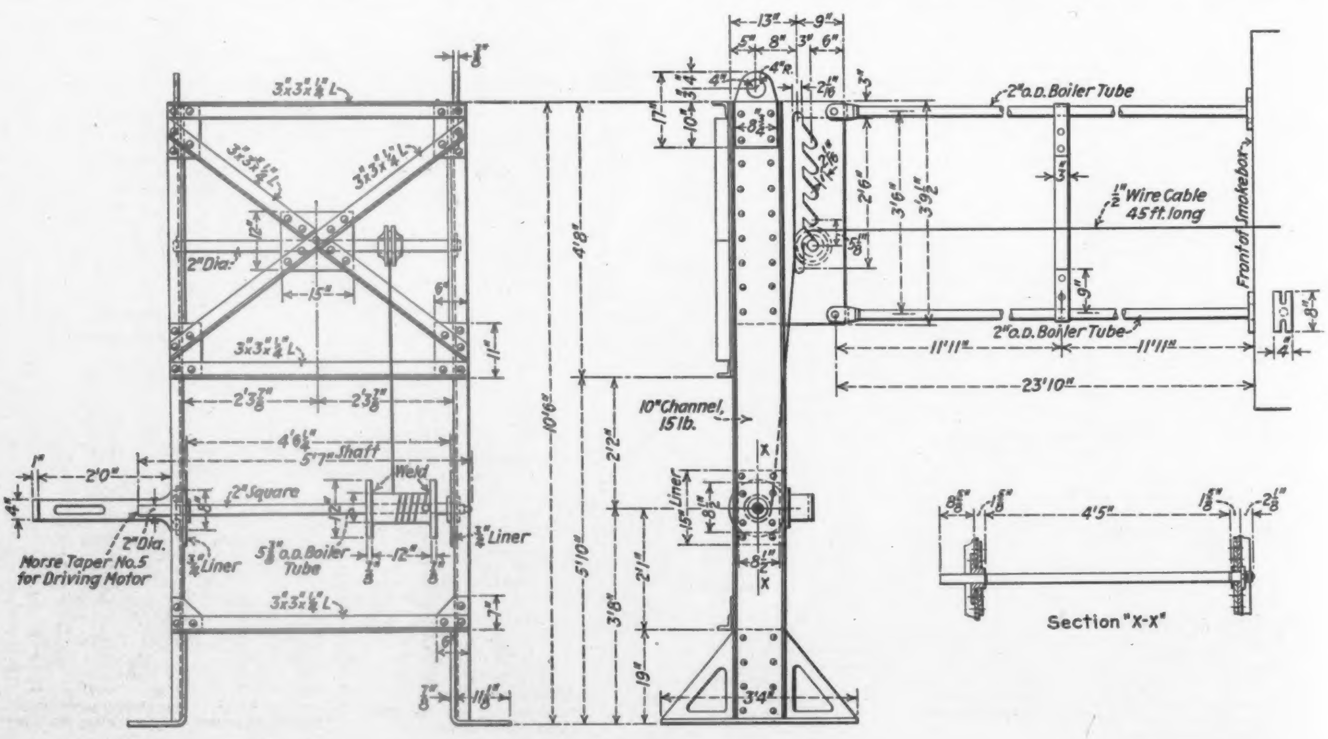
A Superheater-Unit Puller

IN the drawing and photograph is shown a device developed at the McKees Rocks shops of the Pittsburgh & Lake Erie for removing and replacing superheater units. By the use of this machine the laborious task of working Type E units has been reduced to a mechanical operation and the time for removing a complete set of units has been cut to one-third of that

The puller in position for extracting or applying units—The platform has been removed

required when manually handling the job.

The puller consists of two side frames of 10-in. by $2\frac{1}{2}$-in. channels joined together and braced by 3-in. by 3-in. by $\frac{1}{4}$-in. angle sections. The side frames sup-



The superheater unit puller

port an air-operated winch that is adjustable on a 2-in. square rod fitted with No. 5 Morse taper for a reversible air motor which is supported by a 2-ft. cantilever bracket riveted to the frame. The puller is braced by means of four compression rods of 2-in. boiler tube which are bolted to the frame of the puller and to the front end of the smokebox.

The units are removed by a ½-in. steel cable which passes over a pulley downward to the winch. The pulley shaft is supported by side pieces of heavy steel plate in each of which are five slots that provide for adjustment according to the height of the engine or the row of flues from which the units are being extracted.

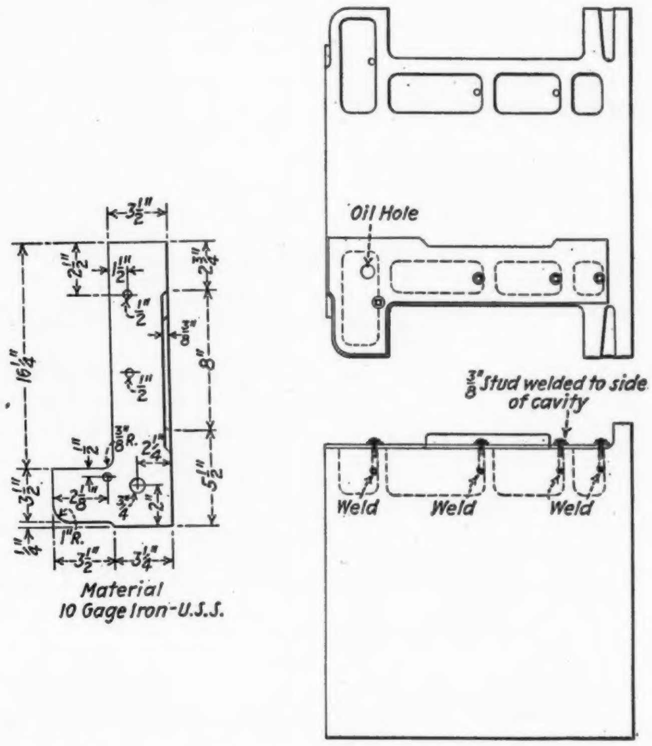
A portable platform is set in front of the engine for receiving the units as they are removed, after which it is moved with the complete set of units by an overhead crane to a unit testing machine. In replacing the units the cable is passed over a pulley supported at the front flue sheet and run out to the platform supporting the units. When the return bends of the units are inserted in the flues the device pulls the unit into the flues to within a few feet of its required position under the superheater header.

An Easily Removed Oil Cavity Cover

A CERTAIN class of locomotives on a large railroad was built with trailer-truck boxes so designed that the oil cavity covers were held in place by 14 ¼-in. bolts. The covers were made of $\frac{1}{16}$-in. material and every time the engines were shopped these covers were so deformed that it was necessary to remove them and either straighten them out or renew them entirely. The removal of the 14 bolts required a great deal of time as in many instances the heads of the bolts had been broken off. This necessitated drilling out the body of the bolt, removing the remaining shell and retapping the hole.

To overcome this condition a new cover of ⅛-in. material was made having the same contour as the original cover. The 14 bolts were replaced by three ⅜-in. studs which were welded into the oil cavity as shown in the drawing. The new covers were drilled to suit the new stud spacing and nuts were applied to hold down the covers.

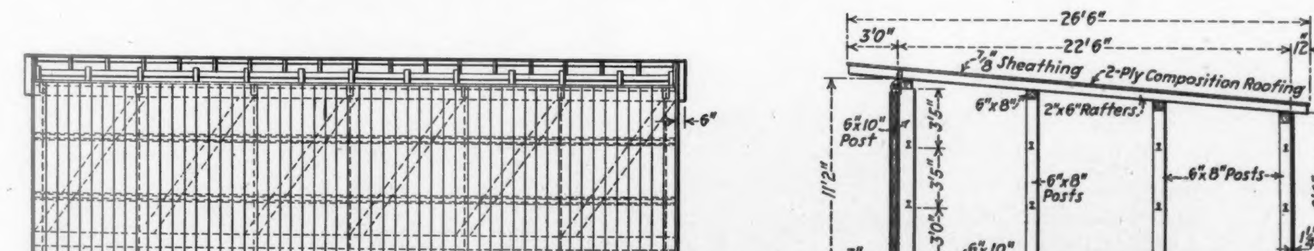
This method has been adopted on all trailer boxes that were originally equipped with the $\frac{1}{16}$-in. covers and the new arrangement has practically eliminated the necessity of replacement and has reduced the labor of removing and replacing.



Method of attaching the cover on trailer-box oil cavities to permit ready removal

An Enclosed Pipe Rack

THE enclosed pipe rack shown in the drawing has been made standard on one road for its shops and larger roundhouses. It is 36 ft. long, 26½ ft. wide, 11 ft. 2 in. high in the front and 9 ft. 6 in. high in the back, and is divided into six sections to facilitate the classification of the various sizes of pipe. The foundation of the rack consists of four rows of concrete piers, 7 ft. 3 in. apart; the piers being spaced 6 ft. apart. On each pier in the front row is mounted a 6 in. by 10 in. post while on all the remaining piers the posts are 6 in. by 8 in.



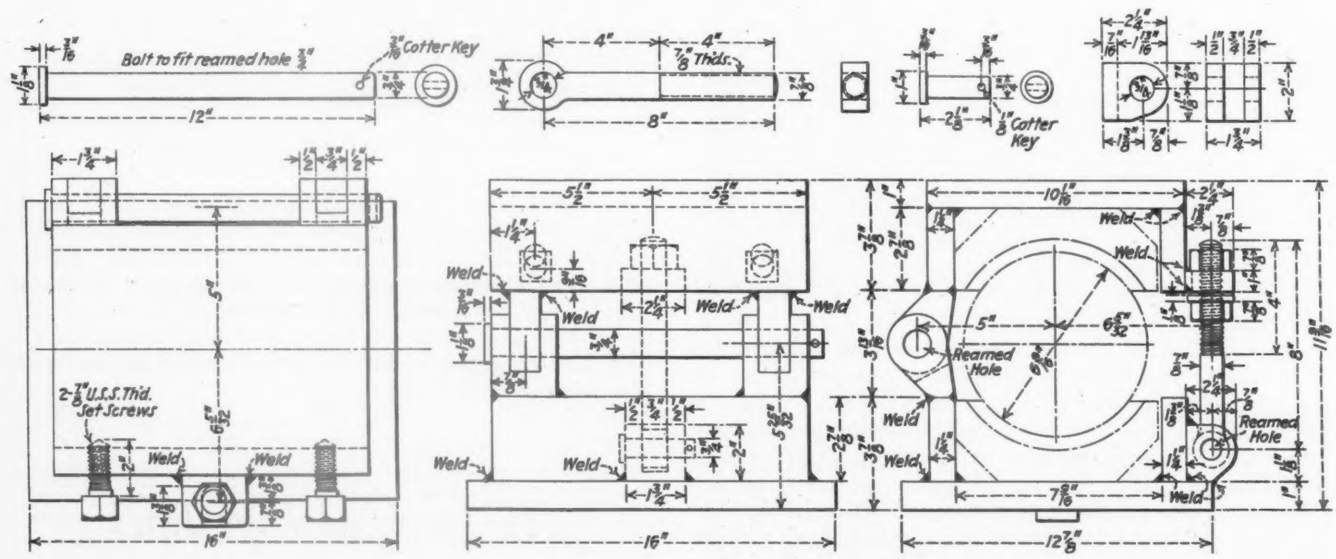
A substantial pipe rack

Two sections of 75 lb. rail supporting the stored pipe are located in each row of posts as shown. The rail sections run the length of the rack at a height of 3 ft. and 6 ft. 6 in. above the floor. The rack has a roof built of ⅞-in. sheathing covered with a two-ply composition roofing and is equipped with Richards-Wilcox ballbearing doors.

Boring Engine- and Trailer-Truck Brasses

THE jig shown in the drawing is one which makes possible the boring of two engine-truck or trailer-truck journal brasses in one set-up on a horizontal or a vertical boring mill. The jig is made in two parts which are hinged at the center line and held together by means of a ¾-in. pin, the distance from the edge of the jig to the center line of the pin being 5-25/32 in. Both sections of the jig are built up of machined parts all of which are welded together, although later jigs made at the shop where it was developed have been made from cast steel. The jig sections are channel-shaped to hold the brasses that are to be bored, the channels being 7-9/16 in. wide, 2-7/8 in. deep and 16 in. long.

A ⅞-in. clamping bolt, 8 in. long, pivoting on a hinge welded to the section which forms the base of the jig, holds the two sections together while the brasses are being bored. This bolt is equipped with a jam nut which serves to hold the jig rigid during the machining operations. Both sections are fitted with two set screws each on the same face to which the clamping bolt is attached. When the journal brasses are inserted in the channels of the sections, the set screws are tightened against them, thus holding them securely in position while being bored. The tool used in conjunction with this jig is of a combination boring and filleting type which eliminates the necessity of changing tools for machining the fillets.



The jig for holding engine- and trailer-truck brasses when boring

* * *


Wide World Photo

Pulverized fuel burning locomotive built for experimental service by the Allgemeine Elektrictats Gesellschaft for the German State Railways

NEW DEVICES

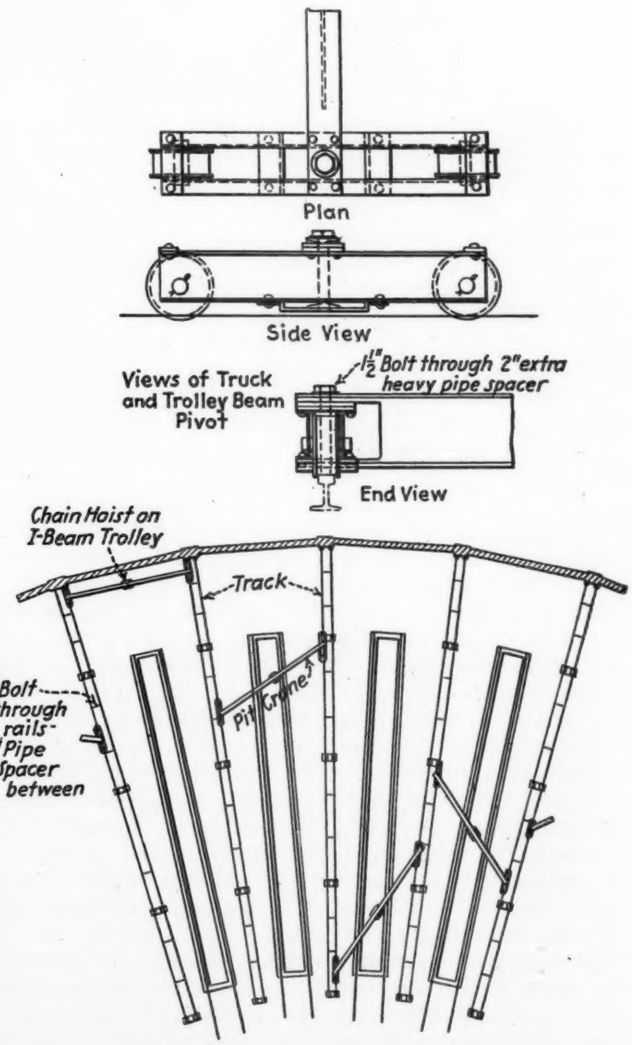
Enginehouse Pit Crane

THE illustrations show the construction and method of installation of a new enginehouse pit crane, developed by the Locomotive Terminal Improvement Company, Chicago, and used at the Wabash enginehouse, North Kansas City, Mo. The crane is made of structural steel, the bridge, or cross member, consisting of an 8-inch. I-beam, supported at each end by a carriage mounted on two double-flange wheels, which provide longitudinal movement the entire length of the pit over a runway supported from reinforced concrete uprights which are part of the building structure. The runway itself consists of track rails securely bolted on top of I-beams although, with suitable truss rods designed to stiffen the rails, it is felt that the I-beam would not be necessary. The hinged pin connection of the bridge member of the crane to the carriage on either side of the pit permits movement of the crane longitudinally over the pit, the varying distance between the rails being accommodated by a corresponding change in angular position of the bridge. This is clearly illustrated in the drawing. An adequate spacing of about 4 ft. 6 in. for the wheel centers on each carriage is essential to proper tracking on the crane runway and to permit easy movement of the crane.

A small, four-wheel trolley, supporting a hand-operated chain hoist, provides free movement across the bridge, enabling the lifting hook to be placed at any desired position necessary to lift various locomotive parts with the maximum convenience. The design is such that the trolley cannot leave or be removed from the I-beam bridge member except by unbolting the trolley castings which are designed with an ample factor of safety.

Pit crane installed at the Wabash enginehouse, North Kansas City, Mo.

This crane arrangement was designed to enable the original building supports to be used as crane foundation without change, and it will be noted that one of the reinforced concrete cross members obstructs a free movement of the chain hoist longitudinally over the pit. This is said to cause no serious difficulty, however, as the hoist is seldom used except when the pit is occupied and in that case a man standing on the locomotive can easily pass the chain over the cross member. The crane is equipped with a chain hoist, although a pneumatic hoist or an electric hoist could be applied if desired. Longitudinal movement of the bridge carriage and the movement of the trolley across the bridge are both effected by hand pulling on the hoist chain from the floor.



Plan of the enginehouse pit-crane installation and details of the hinged pin connection

The new pit crane affords a safe and convenient means of lifting such locomotive parts as dome caps, throttle standpipes, sand domes, smokebox front ends, air com-

pressors, feedwater heaters, electric generators, etc. It is particularly advantageous for the periodic removal and re-application of heavy parts such as pistons, cylinder heads, main and side rods, etc. The crane is located over two enginehouse pits, in which single-wheel drop pits are operated and thus it proves a great convenience for handling drop-pit covers, rail sections, driving boxes, and similar lifting operations common to this class of work.

A Heavy Duty Honing Machine

A VERTICAL heavy-duty honing machine is being manufactured by the Barnes Drill Company, 814 Chestnut street, Rockford, Ill. It is equipped with the company's standard reciprocating and rotating ten-splined spindle that is hydraulically controlled as to length and rapidity of stroke.

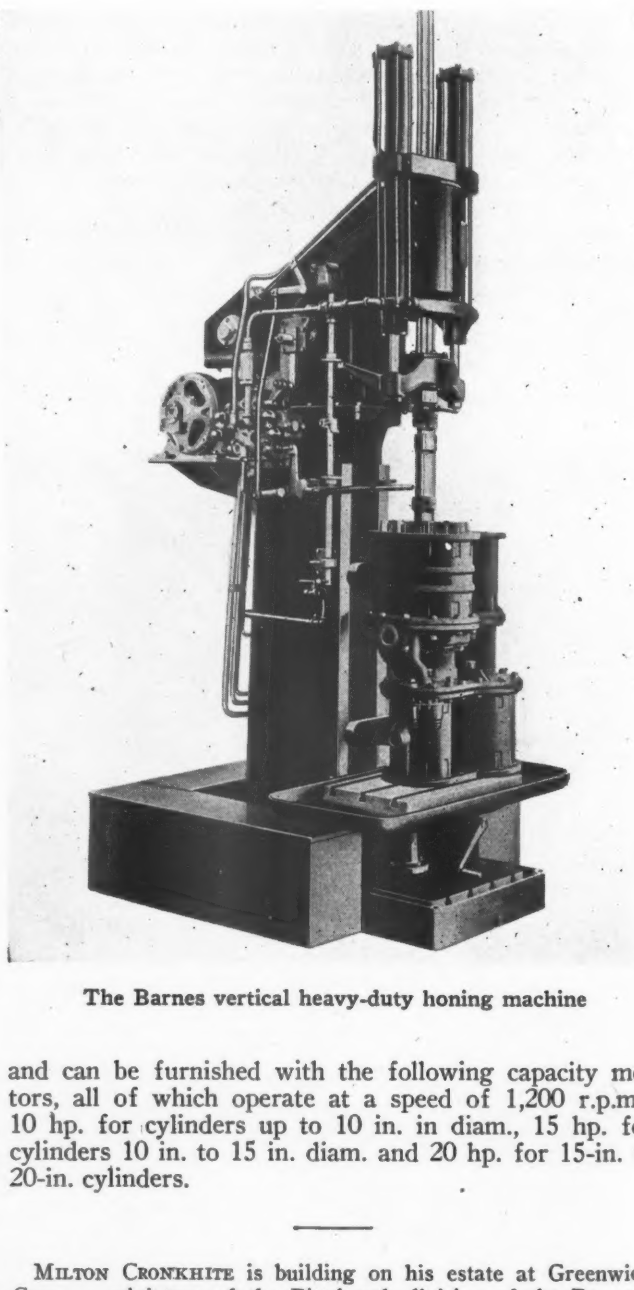
As shown, the machine has a 24-in. swing and is capable of honing cylinders up to 20 in. in diameter. The parallel hydraulic cylinders on opposite sides of the spindle housing minimize the height of the machine and permit various lengths of spindle stroke. The hydraulic cylinders are directly connected to the lower end of the spindle which is driven by a hardened steel bevel crown gear which has an inserted Ackermite bronze hub 7 in. long, both the hub and the spindles being self-oiling. The spindle and hone assembly are balanced by a patented air counterbalance. The machine is equipped with self-oiling radial ball bearings and Timken roller bearings, including the spindle which rotates on Timken bearings.

The machine is furnished with four quick-change spindle speeds. A combined control lever is used to control the operation of a multiple-disc driving clutch, which lever simultaneously starts the reciprocation. A latch on the lever permits the spindle to reciprocate without rotation or to rotate without reciprocation at the will of the operator. The control lever operates a patented three-in-one valve control for an Oilgear pump, the control of which determines the number of cycles of reciprocation per minute.

Hydraulic motion for reciprocating simultaneously with the gear drive that rotates the spindle and hone is used to produce a uniformly honed surface over the full length of the cylinder. The length of the stroke may be set for the right amount of overrun of the hone at each end of the cylinder, this feature preventing bell-mouth, barrel-shape and taper. The machine removes high spots in the reamed bore of cylinders, corrects out-of-round conditions, eliminates taper in the bore and leaves a smooth bearing surface. Large diameter, hard-steel cylinders can be honed to within 0.001 in. if they have been previously reamed to within 0.005 in. to 0.008 in. of the finished size. Soft steel cylinders can be smoothly bored or reamed to within 0.0015 in. or 0.002 in. of the size that is required after honing. The long honing stones, made of a grit and grade that is determined by the smoothness of the finish that is desired, quickly erases the rough edges that are left after boring, remove chatter marks, pass over port holes and recesses and leaves a true edge about these openings and brings the cylindrical walls to a solid, uniform surface that is smooth, round and parallel. The honing stones operate in steel sleeves that are fitted with an automatically expanding feed control with a final stop to prevent oversize.

The machine is adaptable for honing large and small air-brake cylinders, cross-compound compressor cylinders, power-reverse cylinders, firedoor operating cylinders, side-rod bushing retainers, air compressor cylinders and other hydraulic, steam and pneumatic cylinders that are less than 20 in. in diameter and are not over 30 in. in length.

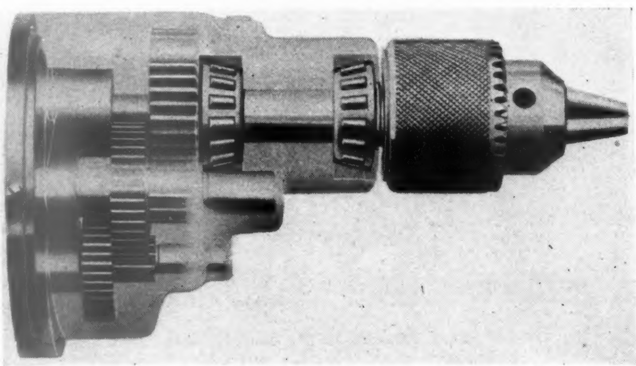
The machine is equipped with silent-chain motor drive and can be furnished with the following capacity motors, all of which operate at a speed of 1,200 r.p.m.: 10 hp. for cylinders up to 10 in. in diam., 15 hp. for cylinders 10 in. to 15 in. diam. and 20 hp. for 15-in. to 20-in. cylinders.


The Barnes vertical heavy-duty honing machine

MILTON CRONKHITE is building on his estate at Greenwich, Conn., a miniature of the Pittsburgh division of the Pennsylvania at a cost of $35,000. Everything, even the scenery, will be on a scale of a quarter of an inch to a foot. He will have 600 pieces of rolling stock.

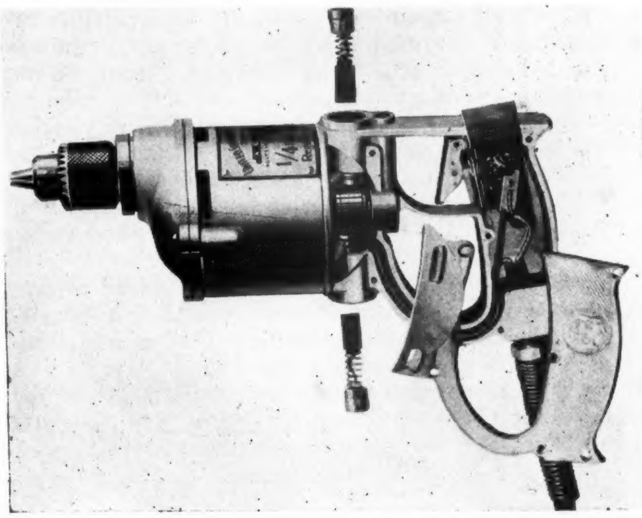
U. S. Drills Redesigned

THE $\frac{5}{8}$-in. and $\frac{3}{4}$-in. heavy-duty drills manufactured by the United States Electrical Tool Company, Cincinnati, Ohio, have recently been equipped with an additional roller bearing in the chuck spindle. This design of spindle with a roller bearing at each end has been adopted in these drills to provide for double thrust and also to facilitate the operation of the drills in railroad-shop service.



The chuck spindle of U. S. drills are now designed with roller bearings at both ends

The $\frac{1}{4}$-in., $\frac{5}{16}$-in. and $\frac{3}{8}$-in. drills built by this company now include Bohnalite housings and are being designed so that one side of the handle and housing can be removed in one piece, making the switch, wiring and commutator more easily accessible when servicing becomes necessary.



One side of the Bohnalite housing and handle is cast in one piece

The Beaver Four-Post Die Stock

THE Borden Company, Warren, Ohio, has recently added two four-post die stocks to its line and have designated them as the No. 8 and No. 8R Beavers, the former being a plain die stock while the latter is of the ratchet type.

These die stocks are for threading 1-in., $1\frac{1}{4}$-in., $1\frac{1}{2}$-in. and 2-in. pipe, each size being provided with a separate set of dies. The stocks are not equipped with loose bushings for centering the pipe but have a patented, self-contained rear end fitted with grooved guide bolts and washers. The heavy guide bolts are fitted at regular intervals with grooves into which is dropped a hardened steel washer to obtain any desired size of opening of the rear end for centering the pipe to be threaded. The stock is furnished with a grip screw which permits a strong handhold, the cross pin being $2\frac{13}{16}$ in. long. The stocks are equipped with a fully enclosed die-retaining mechanism and are designed with extra heavy upright posts. A standard mark appears near the top of each post so that over- or under-size threads may be cut as desired. The die slots are easily accessible for cleaning and have no pockets or recesses to collect cuttings or dirt.

The No. 8R Beaver four-post die stock

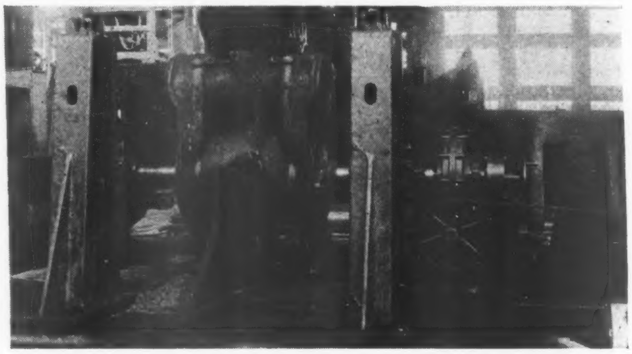
Notwithstanding the heavy grip screws and the heavy upright posts, the die stocks are light in weight, the ratchet tool weighing $12\frac{3}{4}$ lb. as compared with 16 lb. for other standard Borden four-post tools. In the design of these tools they have been furnished with a simple ratchet-pawl mechanism that can easily be repaired by the operator.

THE CHICAGO, ROCK ISLAND & PACIFIC has paid a total of $3,697,885 in pensions to retired employees since its pension system was established in 1910. During 1929, 180 employees were retired, and over $500,000 was paid to retired employees during the year.

Boring Cylinders Integral with Frames

THE boring equipment shown is a recent development of the H. B. Underwood Corporation, 1015 Hamilton street, Philadelphia, and has been designed for the express purpose of boring valve chambers and cylinders that have been cast integral with the frame. The two upright posts, mounted on a bed-plate, carry the end bearings of the bar which may be adjusted at any desired height by means of a hand operated feed-screw. The end bearings, which are split and securely bolted in position, are easily removed and reapplied when setting up the bar. In the illustrated installation a boring bar is set up on each side of the integral frame and cylinder casting, thus boring both cylinders in the same operation and with a considerable saving in time.

Power for driving the equipment is derived from a motor mounted at one corner of the bed-plate and transmitted by belt to the driving spindle. This spindle drives a worm which meshes with a gear that is keyed to the boring bar. Keyed to the feed-screw is a feed gear which meshes with a reverse gear journaled on a pin centered in the bar. The reverse gear turns freely on this pin unless prevented from doing so by an engagement pawl which holds the gear stationary relative to the bar, thus causing the feed-gear to revolve the feed-screw and advance the cutter head into the work.



The Underwood boring bar for cylinders and valve chambers cast integral with the bed

The Roustabout Crane

THE Hughes-Keenan Company, Mansfield, Ohio, has developed the Roustabout crane which is mounted on a McCormick-Deering industrial tractor, Model 20. It is so designed that the boom can swing in either direction and through a full circle on a ball-bearing turntable. A counter-weight box is attached directly above the turntable and is properly situated to counterbalance the load without adding much weight to the tractor. A 12-ft. boom is supplied as standard equipment but an 18-ft. boom can be furnished for service requiring higher lifts. A single cable, as shown in the illustration, is standard equipment but a sheeve with a double reeved cable can be supplied for heavier loads.

The crane has a 6½-ft. wheel base, a maximum height with the boom horizontal of 7 ft. 4½ in. and an overall width of 5 ft. 4 in. With an overall length of 8 ft. 10 in., the boom not included, the crane can be turned in a 33-ft. circle of the outside wheel. The crane will pass through a door opening of 5½ ft. wide by 7½ ft. high, and is so constructed that the operator has a clear view at all times and easy access to all the operating levers, an arrangement which facilitates the handling of the crane and tractor.

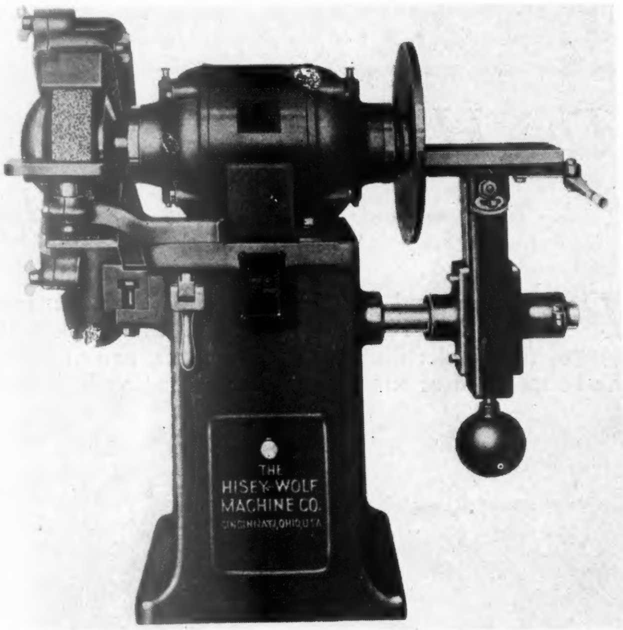
The Hughes-Keenan Roustabout crane

A Combination Disc and Floor Grinder

THE Hisey-Wolf Machine Company, Cincinnati, Ohio, has brought out a combination disc and floor-stand grinder. The spindle of this machine, made of a special steel, is heavily constructed to insure permanent concentricity of the disc and is mounted on two annular ball bearings which are subjected to thrust loads only. A double-acting, self-aligning thrust bearing is provided to take all of the end thrust. Standard equipment on this grinder includes a full safety combination wheel guard, a 20-in. steel disc, an automatic safety motor starter and either plain or universal lever-feed work tables.

The Universal lever-feed table is 14 in. long and 8 in. wide, while the plain work table is 9½ in. by 10 in. A grinding wheel 3 in. wide and 18 in. in diameter is supplied on special order only. The machine has a base 20 in. by 21 in. and is 36 in. high from the base to the center of the spindle, which is 42 in. long. It is designed to operate on 220-volt or 440-volt, three-phase, 60-cycle alter-

nating current at a speed of 1,140 r.p.m., but can also be furnished to special order for two-phase current for 50 cycles at 1,425 r.p.m., 40 cycles at 1,125 r.p.m. and 25

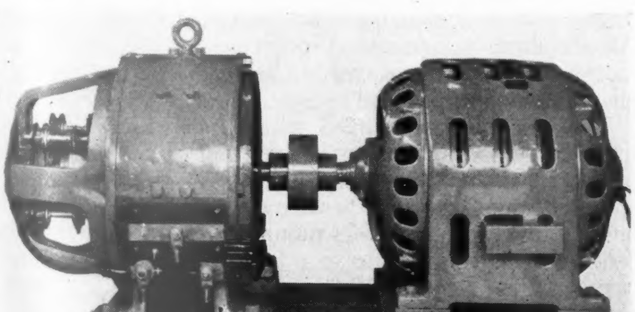


The combination disc and floor-stand grinder

cycles at 1,425 r.p.m. The machine can also be furnished for special voltages ranging from 110 volts to 550 volts.

Welding Bases for Motor-Generator Sets

THE Reliance Electric & Engineering Company, Ivanhoe Road, Cleveland, Ohio, has adopted bases constructed of heavy steel plate, electrically welded together, for use as standard equipment with its motor-generator sets. The pads upon which the motor and the generator rest are lined up horizontally and vertically by using the machines themselves as patterns for doing the alining. Such shims as are needed are placed between the pads and the base and are securely welded



A Reliance motor-generator set mounted on a welded base

in position. Horizontal alinement is maintained by the use of tight-fitting dowels which are driven into the pads, through two diagonally opposite feet of each unit. One or more units may be removed from the base without disturbing the alinement when they are to be replaced.

An Adjustable Drill Stand

THE Buckeye Portable Tool Company, Dayton, Ohio, has recently added the Hercules No. 34-3 portable and adjustable drill stand to its line. This portable pneumatic drill stand has a capacity for a 1¼-in.

The Hercules No. 43-3 portable and adjustable drill stand

drill in steel, has a 7-in. feed and is equipped with a No. 3 Morse taper socket. It has a maximum elevation of the tool of 45 deg. and 25 deg. above and below the horizontal, respectively. The stand also may be raised

or lowered, the maximum height being 44½ in. and the minimum, 32¾ in.

The pedestal has a three-leg base, with double wheel rollers on each leg. In the base is an oil reservoir with a capacity of one-half gallon of oil. The air power is controlled by a foot throttle, leaving the hands entirely free from the air control. An adjustable needle valve connects the oil reservoir to the air hose just above the throttle and permits the proper amount of oil to pass through the hose to the rotor, insuring ample lubrication of that part for a minimum of two weeks of constant operation before refilling the reservoir is necessary. The three-leg base permits the use of the drill in close quarters and the anchoring chain facilitates the operation.

A Radial Drilling Stand

THE Hisey-Wolfe Machine Company, Cincinnati, Ohio, has recently placed on the market a radial drilling stand equipped with a sensitive feed which is adaptable for use with all Hisey portable electric drills up to and including the one of ⅞-in. capacity. The lever feed is operated through a rack and pinion in the same manner as a drill press, thereby permitting a most positive and sensitive control without the slightest fatigue to the operator. The motor-holding brackets are designed so that the portable drill can be attached without removing a single part of the machine.

The arm of the stand, supported by a 2-in. main

A radial drilling stand for portable drills

column, has a full swing of 360 deg. and a maximum reach of 13 in. from the column to the drill spindle. The total vertical adjustment of the stand is 20½ in., 13 in. up and down the main column and 7½ in. by adjustment of the sensitive feed by means of a lever through the rack and pinion. The net weight of the stand is 150 lb.

The Hammond Disc Grinder

THE Hammond Machinery Builders, Kalamazoo, Mich., has recently placed on the market the double disc grinder illustrated. The discs, two of which can be mounted at one time, are machined on both sides

The Hammond double disc grinder

and are reversible, the object of which is to increase the number of service hours with one operation of changing and mounting the disc wheels. Standard equipment includes one plain table and one lever-feed table as illustrated but the machine can be supplied with either two feed tables or two plain tables.

The grinder is equipped with a totally enclosed sealed motor that is cooled by a fan mounted on the spindle. All incoming air passes through an air cleaner to the motor windings, the warm air being discharged through an outlet in the pedestal.

The machine is equipped with a push button control that is mounted in a recess in the front of the pedestal to protect it from accidental starting. A Cutler-Hammer automatic motor starter with overload, low-voltage and phase failure protection is mounted on the door of the pedestal. This machine can be supplied in capacities varying from 3-hp. to 10-hp. and can be furnished with discs ranging from 12 in. to 24 in. in diameter.

MOTOR TRUCKS frequently travel by rail, but it is rather a rare occurrence for a locomotive to travel by truck. Yet this happened in England recentiy, when on a specially built truck a 62-ton locomotive was transported from the builder's plant to the wharves in Liverpool.

Among the Clubs and Associations

CANADIAN RAILWAY CLUB.—The Canadian Railway Club will meet on April 14 at 8 p.m. at the Windsor Hotel, Montreal, Que. E. W. Beatty, president of the Canadian Pacific, will address the meeting.

RAILWAY CAR MEN'S CLUB OF PEORIA AND PEKIN.—Wheels and air brakes will be discussed at the April 15 meeting of the Railway Car Men's Club of Peoria and Pekin which will be held at 7 p.m. at the Union Depot, Peoria, Ill.

WESTERN RAILWAY CLUB.—"This Machine Age—Where Is It Leading Us?" is the title of the paper to be presented by R. V. Wright, managing editor, Railway Age, before the April 21 meeting of the Western Railway Club. The meeting will be at 8 p.m. at the Hotel Sherman, Chicago.

PACIFIC RAILWAY CLUB.—"The Younger Man in Railroading—His Responsibility and Ours" will be the subject discussed by young and older railroad men at the April 12 meeting of the Pacific Railway Club to be held at Sacramento, Cal., at 7:30 p.m.

NEW ENGLAND RAILROAD CLUB.—The Hudson type locomotive will be discussed by G. T. Wilson, general equipment inspector on locomotives, New York Central, before the meeting of the New England Railroad Club which will be held at 6:30 p.m. on April 8 at the Copley-Plaza Hotel, Boston, Mass.

CAR FOREMEN'S ASSOCIATION OF LOS ANGELES.—A. J. Troja, superintendent and agent of the Griffin Wheel Company, will talk on wheels before the April 14 meeting of the Car Foremen's Association of Los Angeles, which will be held at 8:15 p.m. in Room 299, Pacific Electric building, Los Angeles, Cal. Through the courtesy of the Griffin Wheel Company, a film on wheel service will also be shown.

CENTRAL RAILWAY CLUB OF BUFFALO.—Papers on the Operation of Trains on the Lackawanna by Cab Signals with Automatic Speed Control and on the Operation and Maintenance of Automatic Train Stop on the New York Central will be presented at the April 10 meeting of the Central Railway Club of Buffalo which will be held at 8 p.m. at the Hotel Statler, Buffalo, N. Y. The former paper will be read by J. E. Saunders, signal engineer, Delaware, Lackawanna & Western, and the latter by J. J. Corcoran, assistant signal engineer, New York Central. P. J. Langan, supervisor of air brakes, Delaware, Lackawanna & Western, will discuss the papers. A buffet luncheon will be served and entertainment provided by the D. L. & W. Glee Club.

AMERICAN WELDING SOCIETY.—The annual meeting of the American Welding Society will be held on April 23, 24 and 25 at 29 West Thirty-Ninth street, New York. The technical session on the first day will be devoted to papers on the Distribution of Stresses in Fillet Welds and Investigation of Beams Welded to Columns. ¶ An architectural session is being arranged for Thursday, April 24, when papers covering the subject of welding from the viewpoint of the architect and builder will be presented. The dinner in the evening will be a stag affair. ¶ An All-Welded Barge, The Needs of the Metropolitan District for Instruction in Welding, and the Welding of Tube Turns will be the subjects discussed Friday morning, April 25. Meetings of the Structural Steel Welding Committee and the American Bureau of Welding will be held on Friday afternoon.

Club Papers

Conducting Transportation

New England Railroad Club.—Meeting held at the Copley-Plaza Hotel, Boston, Mass., February 11. Paper by J. W. Smith, vice-president and general manager, Boston & Maine, Boston, Mass., on Conducting Transportation. ¶ Mr. Smith spoke of the contribution of the various departments of a railroad in the successful conduct of transportation. The first part of his address was devoted to a review of railroad developments, in which he gave special attention to the development of the locomotive as it occurred in New England and adjoining states. He emphasized the need of railroad men taking an interest in the business welfare of the shipper and gave several instances where such interest on the part of railroad men had been appreciated. He also spoke of the need for the railway supply industry to develop better locomotives and cars which could be operated and maintained more economically so as to secure greater efficiency in railroad transportation.

The Steel Founders' Contribution to the Railroads

New York Railroad Club.—Meeting held at the Engineering Societies building, 25 West Thirty-Ninth stret, New York, on March 21, 1930. Paper by W. M. Sheehan, sales engineer, General Steel Castings Corporation. ¶ Mr. Sheehan's paper traced the development of the steel foundry industry from its early days to the present time and showed, step by step, how steel castings have reduced maintenance costs of railroad equipment and how they were developed as sturdy and substantial foundations for locomotives, tenders, passengers cars and freight cars. ¶ Starting with a comparative study of cars of 1893 with wooden truck bolsters, wooden underframes and steel-plated wooden body bolsters and then the early cars equipped with cast-steel truck sides, Mr. Sheehan discussed the various factors responsible for the demand for steel casting as locomotives and cars increased in size and as car-miles per day, loadings per car, locomotive runs and train-speeds all increased. In tracing the history of steel castings, the speaker described in chronological order the castings as developed for wheel centers, frames, cross-ties, passenger-car trucks, combined double body bolsters and platforms, anti-telescoping car ends, and tender frames. Mr. Sheehan continued the story of the development of steel castings with descriptions of cast-steel engine trucks, trailer-truck cradles, smokeboxes, pilots, water-bottom tender frames, integral locomotive beds, and castings for special equipment such as ore and sulphur cars. ¶ Mr. Sheehan credited the remarkable development of the steel foundry art to patience and constant vigilance in the steel foundry aided by the application of the principles of science and engineering.

Locomotive History

Railway Club of Greenville.—The Railway Club of Greenville, Greenville, Pa., occupies a unique position among the various railroad clubs in the United States and Canada inasmuch as the club publishes a well-edited magazine in lieu of the customary proceedings. The active membership of this club is made up largely of employees of the Bessemer & Lake Erie and the Greenville Steel Car Company, a subsidiary of the Pittsburgh Forgings Company. ¶ The February, 1930, issue of the club magazine contains an interesting historical sketch of the locomotives of the Bessemer & Lake Erie by Roy C. Beaver, assistant mechanical engineer of that road. One of the illustrations shows typical examples of the locomotives purchased by the Bessemer from 1890 to 1929, inclusive. The first locomotive illustrated is a 4-4-0 type having a tractive force of 15,214 lb. and a total weight of 88,000 lb. The latest locomotive shown is a 2-10-4 type recently purchased from the Baldwin Locomotive Works. This locomotive has a rated tractive force of 96,700 lb. and is equipped with a booster, making a total starting tractive force of 109,935 lb. The total weight of this locomotive is 502,630 lb. ¶ Some of the older readers of the *Railway Mechanical Engineer* will remember the purchase by the Bessemer in 1900 of two Consolidated (2-8-0) type locomotives, which at that time were the largest

and most powerful locomotives in the world. These locomotives, road Nos. 150 and 151, carried a weight on the drivers of 225,200 lb. The total weight was 250,-300 lb. and the average driving axle load was 56,300 lb. They had single-expansion cylinders and developed a tractive force of 56,300 lb. They carried an unusually high boiler pressure, 220 lb., as compared with other locomotives built at that time. The Bessemer purchased in all ten locomotives of similar design which were used for drag service on the Conneaut branch. The last two of this class were built by Baldwin in 1913.

Elephants and Peanuts

Canadian Railway Club.—Meeting held at Windsor Hotel, Montreal, Que., January 13, 1930. Address by George F. Meighan, traffic manager, Ringling Bros. and Barnum & Bailey's circus. ¶ Members of the Canadian Railway Club had an opportunity to listen to an interesting address by Mr. Meighan on how the traffic problems of a large circus are handled. In addition to being traffic manager of the joint circuses of Ringling Bros. and Barnum & Bailey, the author is also vice-president of the St. Louis & Hannibal. In arranging the route of the circus, the circus management must know the economic conditions in agricultural communities as well as in manufacturing towns especially with respect to employment. The circus opens the season in Madison Square Garden, New York, and then goes to Boston, Mass., and back to Brooklyn, N. Y., where it shows under canvas. It then goes to Philadelphia, Pa., and continues south until about the first week in May when it proceeds to Washington, D. C., Baltimore, Md., Pittsburgh, Pa., and Cleveland, Ohio. It then goes back to the New England states. With this schedule it arrives in the northern part of the country about the last week in June when the weather is favorable. ¶ The animals are neither watered nor fed en route between cities. Usually the trip is only over night and the animals can be fed in the evening before loading and in the morning after unloading on arrival at destination. ¶ The circus train consists of 110 cars which travels in four sections. The circus employs a master car builder and three light-repair men. All of the cars owned by the circus are of all-steel or composite construction. The three repair men inspect each car in the train once every 24 hours and make any light repairs that are necessary. In case of serious damage the cars are shopped at the nearest railroad car repair shop. The circus is a subscriber to the A. R. A. Rules of Interchange and repair bills against the circus are handled in the usual way.

Air Brake Maintenance

The Manhattan Air Brake Club.—Meeting held at 150 Broadway, New York, March 21, 1930. ¶ The members of the Manhattan Air Brake Club discussed eight topics pertaining to the maintenance and operation of air brakes at its regular meeting in March. Practically all of the roads represented at the meeting are obtaining good results with the M-3 type feed valve in both freight and passenger service and have experienced little difficulty from the choke plugging up or failure of the regulating-valve bushing to seal. One of the roads reported that these valves were operating satisfactorily for from 6 to 14 months without attention. ¶ The discussion of the results being obtained with M-3 type feed valves brought up the question of dirt and rust accumulating in main reservoirs. One road has secured good results in reducing the amount of dirt in the brake system by boiling all main reservoirs in the lye vat each time a locomotive goes into the shop for class repairs. ¶ In discussing the topic of freight-brake failures in transit, it was reported that comparatively little difficulty is experienced with air brakes on freight cars becoming inoperative en route, because of the high standards of inspection and maintenance that are now in effect. As a rule, when such failures do occur, they were found to be due to moisture and dirt in the brake cylinder. One road reported that it was getting better results by using a wooden paddle about 10 in. long for lubricating the walls of brake cylinders instead of a paint brush. ¶ Other subjects discussed at this meeting were the 3-D test rack for testing distributing valves, and whether or not it was necessary to provide test apparatus for testing the distributing valve by itself; the operation of brake rigging on passenger cars, the question being raised as to whether any road is having difficulty in obtaining the proper return of the brake rigging after release, due to the weight of the levers and rods required on heavy cars; and brake cylinder packing cup lubrication. The discussion of the paper to be presented at the convention of the Air Brake Association in May was held over until the April meeting.

Safety First in Shop Operation

Eastern Car Foremen's Association.—Meeting held at the Engineering Societies building, 25 West Thirty-Ninth street, New York, February 28, 1930. Paper by A. H. Faerber, shop superintendent, New York Central Lines, Buffalo, N. Y. ¶ Mr. Faerber outlined the progress made in Safety First practice on the New York Central Lines during the past five years and dwelt at length on the various factors which have been responsible for the reduction in reportable accidents during that period. Taking the East Buffalo car shop as an example of the steps made in accident prevention, he stated that during 1926 there were 64 reportable accidents, while during 1927 there were 36 such accidents, or a reduction of 44 per cent. During 1928 there were 25 accidents which caused an employee to lose more than three days' time, or a reduction of 31½ per cent over 1927, while in 1929 there were only eight reportable accidents, or a reduction of 68 per cent over the preceding year. ¶ Devoting the remainder of the paper to the methods used to secure these large reductions in accidents each year, Mr. Faerber said that one of the first moves along the lines of Safety First was to educate the supervisors, because safety talks, safety bulletins, shop safety committees, the correction of unsafe conditions and the application of safety appliances did not bring about the desired results and that it was not until the supervisory staff was educated and sold on Safety First that any commendable results were obtained. The foreman, he continued, who realizes fully the humane feature which is paramount in Safety First will always be on the alert for unsafe conditions in his department, whether it be in the methods of performing the work or in the application of safety devices. It costs the supervisor nothing to bid the employees the time of the day when he passes them going to and from work. A "good-morning" and a smile will start most employees to work with a feeling of contentment in their work and their surroundings, with the result that they are apt to be more careful. ¶ "Accidents do not just happen," he stated. "There is a cause behind each of them, which might be unsafe conditions, improper methods of performing work, thoughtlessness, carelessness, and frequently ignorance on the part of the employees. We dare not wait to report an unsafe condition or practice; it must be immediately corrected and a report made later. If it can not be done by ourselves, necessary precaution must immediately be taken and a report made to the proper authorities to have the corrections made." ¶ Other features which aided in bettering the safety performance of the East Buffalo shops, as included in the paper, were: The proper instruction of new employees and wherever possible permitting them to work with experienced workmen; instructing the men as to the proper methods in performing hazardous jobs; a clean shop; a well-equipped first-aid room, and a high degree of co-operation between the general safety committees, the shop superintendent, the general foremen, the supervisors and the men.

Five-Year Apprenticeship on the Canadian National

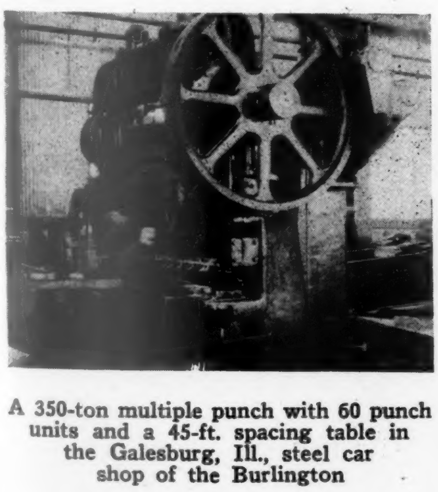
Central Railway Club.—Meeting held Hotel Statler, Buffalo, N. Y., March 13, 1930. Paper by M. A. Humber, supervisor of apprentices, Central Region Canadian National. ¶Mr. Humber described the system of training mechanical-department apprentices on the Canadian National. This system includes school-room instruction, as well as the usual shop training, and the class-room system is entirely under the supervision of officers of the company, including text books and revisions which are compiled by the supervisor and his staff. ¶Applicants for apprenticeships must be between the ages of sixteen and twenty-one years and must pass an examination in arithmetic, spelling, eyesight and hearing with marks of at least 75 per cent in each subject before

being accepted. The term of apprenticeship covers five years, the first half year of which is a probationary period, at the completion of which a boy is dismissed if he does not show ability, or indentured if he shows promise of developing into a good mechanic. ¶Mr. Humber claimed for the Grand Trunk, now a part of the Canadian National, the honor of having done the pioneer work in the modern development of apprenticeship systems, beginning its development over twenty-six years ago. School-room instruction, he said, began in a small way with night classes in one of the main shops and has now spread to include work supervised by competent instructors during working hours at every shop, enginehouse and car repair station where apprentices are employed.

Quick Turnover of Motive Power an Aid to Economy

Western Railway Club.—Meeting held at the Hotel Sherman, Chicago, March 17, 1930. Address by G. H. Houston, president, Baldwin Locomotive Works, Philadelphia, Pa. ¶Mr. Houston strikingly developed the changes which have taken place in the steam locomotive during the past twenty-five years, pointing out not only the great increases in size and capacity which have developed within that period, but also the improvements in economy of operation and in the materials available for use in locomotive construction. ¶In speaking of the status of locomotive development today as represented by the most modern examples of design, he contrasted the relatively slow rate of replacement of old locomotives with those embodying all the features of modern design with the rate at which other industries replace their primary tools with those of modern design. In commenting on the increases in the utilization of locomotives which have been effected during recent years, he said that the practice of using the fewest number of locomotives to perform a given service, thus getting out of them their mileage life within the fewest possible years, offered the opportunity for retiring and replacing them sooner, which would mean an earlier utilization of the advantages offered by completely modern motive-power units.

* * *



A 350-ton multiple punch with 60 punch units and a 45-ft. spacing table in the Galesburg, Ill., steel car shop of the Burlington

Directory

The following list gives names of secretaries, dates of next or regular meetings and places of meeting of mechanical associations and railroad clubs

Air-Brake Association.—T. L. Burton, Room 5605 Grand Central Terminal building, New York. Next meeting, May 13 to 16, Hotel Stevens, Chicago.

American Railway Association.—Division V. —Mechanical.—V. R. Hawthorne, 431 South Dearborn St., Chicago. Annual convention June 18-25, Atlantic City, N. J.

Division V.—Equipment Painting Section.—V. R. Hawthorne, Chicago. Next meeting, Sept. 9-11, 1930, Congress Hotel, Chicago.

Division VI.—Purchases and Stores.—W. J. Farrell, 30 Vesey street, New York. Annual convention, June 18-20, 1930, Atlantic City, N. J.

Division I.—Safety Section.—J. C. Caviston, 30 Vesey street, New York.

Division VIII.—Car Service Division.—C. A. Buch, Seventeenth and H streets, Washington, D. C.

American Railway Tool Foremen's Association.—G. G. Macina, 11402 Calumet avenue, Chicago. Next meeting, September 10, 11 and 12, Hotel Sherman, Chicago.

American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. Thirty-ninth street, New York.

Railroad Division.—Paul D. Mallay, chief engineer, transportation department, Johns-Manville Corporation, 292 Madison avenue, New York.

Machine Shop Practice Division.—Carlos de Zafra, care of A. S. M. E., 29 West Thirty-ninth street, New York.

Materials Handling Division.—M. W. Potts, Alvey-Ferguson Company, 1440 Broadway, New York.

Oil and Gas Power Division.—L. H. Morrison, associate editor, Power, 475 Tenth avenue, New York.

Fuels Division.—A. D. Black, associate editor, Power, 475 Tenth avenue, New York.

American Society for Steel Treating.—W. H. Eiseman, 7016 Euclid avenue, Cleveland, Ohio.

American Society for Testing Materials.—C. L. Warwick, 1315 Spruce street, Philadelphia, Pa. Annual meeting Atlantic City, N. J., June 23-27.

American Welding Society.—Miss M. M. Kelly, 29 West Thirty-ninth street, New York.

Association of Railway Electrical Engineers.—Joseph A. Andrucetti, C. & N. W., Room 411, C. & N. W. Station, Chicago, Ill.

Association of Railway Supply Men.—J. W. Fogg, MacLean-Fogg Lock Nut Company, 2649 N. Kildar avenue, Chicago. Meets with International Railway General Foremen's Association.

Boiler Maker's Supply Men's Association.—Frank C. Hasse, Oxweld Railroad Service Company, 230 N. Michigan avenue, Chicago. Meets with Master Boiler Makers' Association.

Canadian Railway Club.—C. R. Crook, 129 Charon street, Montreal, Que. Regular meetings, second Tuesday in each month, except June, July and August, at Windsor Hotel, Montreal, Que.

Car Foremen's Association of Chicago.—G. K. Oliver, 7836 So. Morgan street, Chicago, Ill. Regular meeting, second Monday in each month, except June, July and August. Great Northern Hotel, Chicago, Ill.

Car Foremen's Club of Los Angeles.—J. W. Krause, 514 East Eighth street, Los Angeles, Cal. Meetings second Friday of each month in the Pacific Electric Club building, Los Angeles, Cal.

Car Foremen's Association of St. Louis.—F. G. Weigman, 720 North Twenty-third street, East St. Louis, Ill. Regular meeting, first Tuesday in each month, except June, July and August, at American Hotel Annex, St. Louis, Mo.

Central Railway Club of Buffalo.—T. J. O'Donnell, 1004 Prudential building, Buffalo, N. Y. Regular meeting, second Thursday each month, except June, July and August, at Hotel Statler, Buffalo.

Cincinnati Railway Club.—D. R. Boyd, 3328 Beekman street, Cincinnati. Regular meeting second Tuesday, February, May, September and November.

Cleveland Railway Club.—F. L. Frericks, 14416 Adler avenue, Cleveland, Ohio. Meeting first Monday each month, except July, August and September, at Hotel Hollenden, East Sixth and Superior avenue.

Eastern Car Foremen's Association.—E. L. Brown, care of the Baltimore & Ohio, Staten Island, N. Y. Regular meetings fourth Friday of each month.

International Railroad Master Blacksmith's Association.—W. J. Mayer, Michigan Central, 2347 Clark avenue, Detroit, Mich. Next meeting September 23-25, 1930, Hotel Sherman, Chicago.

International Railroad Master Blacksmiths' Supply Men's Association.—J. H. Jones, Crucible Steel Company of America, 650 Washington boulevard, Chicago.

International Railway Fuel Association.—C. T. Winkless, Room 707, LaSalle Street Station, Chicago. Next meeting May 6-9, 1930, Hotel Sherman, Chicago.

International Railway General Foremen's Association.—William Hall, 1061 W. Wabasha street, Winona, Minn. Next meeting, September 16 to 19, inclusive, Hotel Sherman, Chicago.

International Railway Supply Men's Association.—L. R. Pyle, Locomotive Firebox Company, Chicago. Meets with International Railway Fuel Association.

Louisiana Car Department Association.—L. Brownlee, 3212 Delachaise street, New Orleans, La. Meetings third Thursday in each month.

Master Boilermaker's Association.—A. F. Stiglmeier, secretary, 29 Parkwood street, Albany, N. Y. Annual meeting May 20-23, William Penn Hotel, Pittsburgh, Pa.

Master Car Builders' and Supervisors' Association.—A. S. Sternberg, master car builder, Belt Railway of Chicago. Next convention August 26-28, Book-Cadillac Hotel, Detroit.

National Safety Council.—Steam Railroad Section: W. A. Booth, Canadian National, Montreal, Que. Annual congress, September 29-October 4, William Penn and Fort Pitt Hotels, Pittsburgh, Pa.

New England Railroad Club.—W. E. Cade, Jr., 683 Atlantic avenue, Boston, Mass. Regular meeting second Tuesday in each month, excepting June, July, August and September. Copley-Plaza Hotel, Boston.

New York Railroad Club.—Meetings third Friday in each month, except June, July and August, at 29 West Thirty-ninth street, New York. Douglas I. McKay, executive secretary, care of Standard Stoker Company, 350 Madison avenue, New York.

Pacific Railway Club.—W. S. Wollner, P. O. Box 3275, San Francisco, Cal. Regular meetings, second Tuesday of each month in San Francisco and Oakland, Cal., alternately.

Pueblo Car Men's Association.—I. F. Wharton, chief clerk, Interchange Bureau, Pueblo, Colo.

Railway Business Association.—Frank W. Noxon, 1124 Woodward building, Washington, D. C.

Railway Car Men's Club of Peoria and Pekin.—C. L. Roberts, chief clerk, Peoria & Pekin Union Railway, 217 Lydia avenue, Peoria, Ill.

Railway Club of Greenville.—Paul A. Minnis, Bessemer & Lake Erie, Greenville, Pa. Meetings third Thursday of each month, except June, July and August.

Railway Club of Pittsburgh.—J. D. Conway, 515 Grandview avenue, Pittsburgh, Pa. Regular meeting fourth Thursday in month, except June, July and August. Ft. Pitt Hotel, Pittsburgh, Pa.

Railway Equipment Manufacturers' Association.—F. W. Venton, Crane Company, 836 South Michigan avenue, Chicago. Meets with Traveling Engineers' Association.

Railway Fire Protection Association.—R. R. Hackett, Baltimore & Ohio, Baltimore, Md. Next meeting October 21-23.

Railway Supply Manufacturers' Association.—J. D. Conway, 1841 Oliver building, Pittsburgh, Pa. Meets with Mechanical Division and Purchases and Stores Division, American Railway Association.

St. Louis Railway Club.—B. W. Frauenthal, M. P. O. Drawer 24, St. Louis, Mo. Regular meetings, second Friday in each month, except June, July and August.

Southern and Southwestern Railway Club.—A. T. Miller, P. O. Box 1205, Atlanta, Ga. Regular meetings third Thursday in January, March, May, June, September and November. Annual meeting third Thursday in November, Ansley Hotel, Atlanta, Ga.

Supply Men's Association.—E. H. Hancock, treasurer, Louisville Varnish Company, Louisville, Ky. Meets with Equipment Painting Section, Mechanical Division, American Railway Association.

Supply Men's Association.—Bradley S. Johnson, W. H. Miner, Inc., Chicago. Meets with Master Car Builders and Supervisors' Association.

Traveling Engineers' Association.—W. O. Thompson, 1177 East Ninety-eight street, Cleveland, Ohio. Next meeting September 23-26, 1930, Hotel Sherman, Chicago.

Western Railway Club.—W. J. Dickinson, 343 South Dearborn street, Chicago. Regular meetings, third Monday in each month, except June, July and August.

NEWS

THE ERIE has opened a passenger car repair shop at Susquehanna, Pa. The shop, formerly used for locomotive repairs, has been reconditioned and can handle work on 50 cars at the same time.

THE PENNSYLVANIA has awarded a contract to Sinclair & Grigg, Philadelphia, for the building of a ten-stall extension to the enginehouse at the South Philadelphia, Pa., terminal yard, the cost of which is estimated at $57,000.

THE CHICAGO, MILWAUKEE, ST. PAUL & PACIFIC has awarded a contract for the construction of a one-story addition to the forge and blacksmith shop at West Milwaukee, Wis., to Lupinski, Inc., Milwaukee, Wis. With other improvements, this will involve an expenditure of about $50,000.

FIRE, believed to be due to spontaneous combustion, destroyed the coach paint shops of the Cleveland, Cincinnati, Chicago & St. Louis at Beech Grove, Ind., on February 28, with an estimated loss of equipment and buildings of nearly $1,000,000. Twenty-five coaches and one business car were in the shops at the time of the fire.

THE GREAT NORTHERN has awarded a contract to the Railway Engineering Equipment Company, Chicago, for the construction of a direct steaming system for the utilization of lignite as fuel in its enginehouse at Minot, N. D. A contract for the installation of boiler washing facilities and a direct steaming system to serve an addition to the enginehouse now under construction at Great Falls, Mont., has been awarded to the Miller Heating Company, Chicago.

THE BOARD OF DIRECTORS of the Chicago, Milwaukee, St. Paul & Pacific, has approved a budget of $15,000,000 to be expended for improvements to physical property during 1930. Among the projects provided for in the budget are the following: Completion of the new car repair shop at Milwaukee, Wis., $1,588,000; new enginehouse and engine terminal facilities at Sioux Falls, S. D., $126,300. Other general items of expenditure include: improvements to shops and enginehouses, $785,700, and fuel and water stations, $439,000.

THE CHICAGO, ROCK ISLAND & PACIFIC plans the expenditure of $250,000 at its new East Des Moines (Iowa) terminal during 1930. Work to be done this year will be part of a project for the elimination of the present terminal at Valley Junction, Iowa, west of Des Moines, and will require an ultimate expenditure of about $2,000,000 within the next three years. During 1930 four yard tracks, each 4,000 ft. long, will be constructed, four other tracks will be extended to 4,000 ft., 10 stalls will be added to the roundhouse, a wash and locker room building and a storehouse and platform will be constructed, the cinder handling plant will be provided with an additional unit, an addition will be constructed to the power plant and a sanitary sewer system will be installed. The ultimate plans provide for the construction of a 59-stall roundhouse, a machine shop, a power house, a lumber shed, a car repair shop and additional yard tracks.

Soviet Commission To Study American Railroads

THIRTY-FOUR ENGINEERS, representing the Commissariat for Transportation of Soviet Russia, have recently arrived in this country to make an intensive three-months study of rolling stock and operating methods on American railroads.

After inspecting the Baldwin Locomotive Works and various railroad facilities in the vicinity of Philadelphia, Pa., the delegation visited Washington, D. C., and Altoona, Pa., where they examined the Pennsylvania shops. The complete itinerary also includes visits to Chicago and St. Louis, and to the Ford Motor Company's plant at Detroit, Mich., as well as a thorough examination of railroad facilities at various points in the northwest.

Wage Statistics for December

CLASS I RAILWAYS reported to the Interstate Commerce Commission a total of 1,605,085 employees as of the middle of the month of December, a decrease of 75,942 as compared with the number in November and of 16,825 as compared with December, 1928. The total compensation was $234,081,322, an increase of 1.36 per cent as compared with December, 1928, because of increased overtime employment and higher average hourly earnings.

Equipment in Need of Repair

CLASS I RAILROADS on February 15 had 121,744 freight cars in need of repair or 5.5 per cent of the number on line, according to the Car Service Division, American Railway Association. This was a decrease of 2,516 over February 1, at which time there were 124,260 or 5.6 per cent. Freight cars in need of heavy repairs on February 15 totaled 85,248 or 3.9 per cent, an increase of 1,349 compared with February 1, while freight cars in need of light repair totaled 36,496 or 1.6 per cent, a decrease of 3,865 compared with February 1.

Locomotives in need of repair on February 15 totaled 8,541 or 15.2 per cent of the number on line. This was an increase of 604 compared with February 1, at which time there were 7,937 locomotives, or 14.1 per cent. Locomotives in need of classified repairs on February 15 totaled 4,635 or 8.2 per cent, an increase of 353 compared with February 1, while 3,906 locomotives or seven per cent were in need of running repairs, an increase of 251 over February 1. Class I railroads on February 15 had 6,011 serviceable locomotives in storage compared witth 5,958 on February 1.

Representatives of the Soviet Commissariat for Transportation

The delegation, which recently arrived from the Soviet Union to spend three months studying American railroads, includes the heads of the principal departments of the Commissariat for Transportation of the U. S. S. R. Seated, left to right, starting third from left, are: S. A. Bogdanov, chief of the traction department; V. J. Kuritzin, president of the state machine-building works; J. N. Mironov, general manager of the central administration of railway transport; D. E. Sulimov, first vice-commissar and head of the delegation; P. S. Shushkov, chief inspector of railways; M. M. Kaganovich, chief efficiency engineer, and G. D. Ulanov, president of the Donetz Railway.

Baltimore & Ohio Celebrates With a Dinner

THE REDUCTION in casualties among employees on the Baltimore & Ohio in 1929 was 49.7 per cent, as compared with 1928; such a remarkable record that a dinner was held in Baltimore on March 3 to celebrate it.

Winners in the safety contest are named as follows: J. P. Kane, superintendent, bolt and forge shops, Cumberland, Md., whose men showed 100 per cent decrease in accidents; R. S. Welch, division engineer, Cincinnati Terminal division, Cincinnati, with a 95 per cent decrease; R. H. Cline, master mechanic, Grafton, W. Va., 93 per cent; J. E. Fahy, superintendent, Garrett, Ind., 75 per cent; J. D. Beltz, superintendent, Connellsville, Pa., 60 per cent; F. B. Mitchell, general superintendent, Cleveland, Ohio, 57 per cent, and C. W. Van Horn, general manager, Cincinnati, Ohio, 53 per cent decrease. Also special awards were made to C. G. Slagle, master mechanic, Indianapolis, and J. M. Shay, master mechanic, Cincinnati, Ohio.

New York Central Safety Records

PRESIDENT P. E. CROWLEY, of the New York Central, on February 27, at a meeting of officers of the road, in New York City, presented plaques to the winners in each of the two groups, Group A and Group B, for the best employee safety record in the year 1929. The New York Central System is made up of 12 railroads (the New York Central proper counting as two, Lines East and Lines West), and Group A consists of the larger roads and Group B the smaller ones. In Group A the winner was the Cleveland, Cincinnati, Chicago & St. Louis, with a ratio of 8.48 casualties per million man hours; in Group B, the Chicago River & Indiana was the winner, with a ratio of 5.30.

Charles E. Hill, general safety agent, in summarizing the records of 1929 said that in the A. R. A. competition, calling for 35 per cent reduction in casualties to employees in seven years from 1923, the New York Central lines had gone far ahead of the goal, having shown at the close of 1929 a decrease of 65.5 per cent. In the six years ending with 1929, the New York Central lines have carried more than five hundred million passengers and, in that time, have had to record only two passengers killed in train accidents, one in 1925 and one in 1927.

Another striking comparison cited by Mr. Hill was the following: Employees killed and injured on duty in the year 1913, killed, 354, injured, 13,107; in 1929, killed, 140, injured, 4,206. In 1913, there were 44 employees killed in train accidents, in 1929 only four; in 1913 the number injured in train accidents was 620, while in 1929 it was 50.

Safety Precepts for April

E. R. COTT, chairman of the Committee on Education of the Safety Section, A. R. A., in circular No. 255, proposing a program for the attention of safety departments during the month of April, takes for his text the foreman's responsibility for the safety of his men.

Quoting from a paper by the chairman of the Section, Mr. Cott discusses the importance of the foreman as the keystone of his organization. The foreman interprets the wishes of the management to the men and the needs of the men to the management. A foreman is not simply a better mechanic, he must be capable of leadership; he has vision as do all competent men, but he also has supervision which means not merely superintendence but *better* vision. The competent leader not only is a thinker but he inspires his men to think.

The foreman is exhorted to think specially about the new man, the youngster just entering industry. In selecting a machine, the foreman exercises his best forethought; should he not exercise the same care in selecting men? For a machine, a substantial foundation is built; take care to build a substantial foundation for the new man. "Go with him to the job and introduce him to his new associates; make him feel at home and among friends. At this time, he is more susceptible to the foreman's good influences than he will ever again be; he wants to learn, he wants to do right, he wants to like his boss. If the foreman fails to take advantage of this opportunity, he may

Domestic Equipment Orders Reported During March, 1930

Locomotives

Name of company	No. locos. ordered	Type	Builder
Union Pacific	25	4-12-2	American Loco. Co.
Maine Central	2	4-6-4	Baldwin Loco. Wks.
Alabama State Docks	1	Switching	American Loco. Co.
Lamm Lumber Co.	1	2-8-2	Baldwin Loco. Wks.
Elgin, Joliet & Eastern	8	2-8-2	Baldwin Loco. Wks.
Durham & Southern	2	2-10-0	Baldwin Loco. Wks.
Akron & Barberton Belt	4	Switching	Baldwin Loco. Wks.
Total for the month of March	43		

Freight Cars

Name of company	No. cars ordered	Type	Builder
Monessen Southwestern	10	Gondola car bodies	Koppel Industrial Car & Equipment Co.
North American Car Corporation	75	Tank	Pressed Steel Car
American Refrigerator Transit Co.	800	Refrigerator	Mt. Vernon Car Mfg. Co.
	200	Brine Tank Refrigerator	
Bangor & Aroostook	400	Box	Company Shops
American Refrigerator Transit Co.	19	Refrigerator	Mt. Vernon Car Mfg. Co.
U. S. Navy	4	Tank	General American Tank Car Corp.
North American Car Corp.	50	Tank	Pressed Steel Car
Seaboard Air Line	1000	Box	Pullman Car & Mfg. Corp.
	1000	Box	Standard Steel Car
Pacific Fruit Express	500	Refrigerator	Company Shops
Minneapolis, St. Paul & Sault Ste. Marie	200	Box	Standard Steel Car
	200	Hopper	Pullman Car & Mfg. Corp.
Pennsylvania Salt Manufacturing Co.	1	Tank	General American Tank Car Corp.
General Electric	5	Flat car bodies	American Car & Fdy.
Total for the month of March	4464		

Passenger Cars

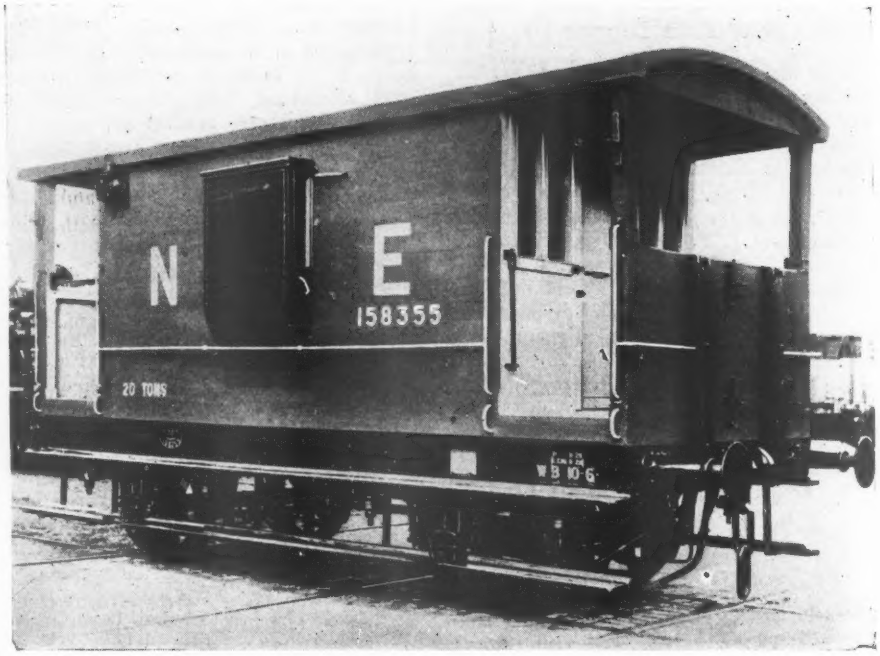
Name of company	No. cars ordered	Type	Builder
Long Island	25	Passenger	Pressed Steel Car Co.
	20	Passenger	American Car & Fdy. Co.
Louisville & Nashville	4	Passenger and Baggage	American Car & Fdy. Co.
	4	Vestibule Coaches	American Car & Fdy. Co.
	2	Baggage and Mail	American Car & Fdy. Co.
	3	Dining	American Car & Fdy. Co.
	10	Baggage	Pressed Steel Car Co.
Chicago, Rock Island & Pacific	5	Baggage	American Car & Fdy. Co.
Chesapeake & Ohio	30	Coaches	Pullman
	11	Coaches	Standard Steel
	6	Mail and Express	American Car & Fdy. Co.
	15	Baggage and Passenger	Pressed Steel Car Co.
	5	Passenger, Baggage and Mail	St. Louis Car
	8	Coaches	Pullman
Pere Marquette	12	Baggage and Express	American Car & Fdy. Co.
Hocking Valley	4	Coaches	Standard Steel
Southern Pacific	5	Dining	Pullman Car & Mfg. Co.
Total for the month of March	169		

miss it forever, for a little later, perhaps other and unfriendly influences may guide and alienate him."

To tell a man not to get hurt is too indefinite; show him how and where liability to injury exists. The injunction to the man may have to be repeated many times. The employee must be made to believe in the utter sincerity of the foreman. Remember the difference between discipline and punishment. Discipline is teaching, punishment is a penalty to be applied only after teaching has failed.

If a foreman has failed to prevent an accident, he has a definite duty to perform after that accident occurs. A foreman should make it a rule in the case of an injury, to accompany the injured man to the surgeon, keep in touch with him, see that his family does not suffer, etc.

The ideal foreman educates his men so thoroughly that they do as well when he is absent as when he is present. If you get them to believe thoroughly in your leadership, you will develop them into heart servants instead of eye servants.



International News
The London & North Eastern's concrete caboose

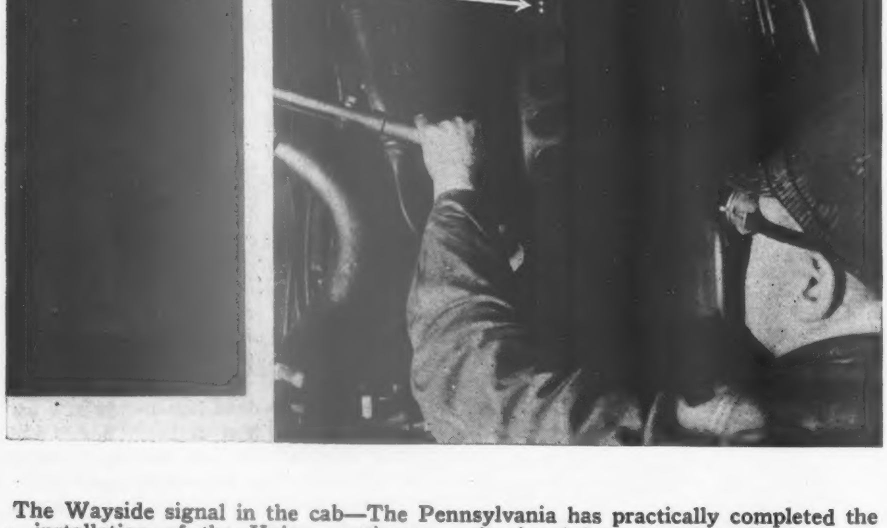
L. N. E. Tests Concrete Caboose

A CONCRETE BRAKE VAN, or caboose, has recently been completed by the London & North Eastern of Great Britain at its Temple Mills (London) shops. The new car is equipped with a standard steel underframe and standard fittings, but its sides, floor and roof are made of concrete reinforced with steel. Some of the main girders are anchored in the concrete floor to avoid the necessity of using holding bolts. The wooden caboose cars heretofore used in Great Britain have been weighted with cast iron ballast to give added braking efficiency, but the weight of approximately 20 tons secured by building the new car of concrete makes such ballast unnecessary. If the new car successfully meets service conditions, other similar cabooses may be built.

Cab Signals on the Pennsylvania

THE INSTALLATION of the Union continuous cab signal on the Pennsylvania line between New York and Washington, 224 miles, has now been so far completed that all steam trains have this protection except on a few short sections where the installation of the wayside apparatus awaits completion of other improvements. The completion of this improvement will be accomplished within six months and the total cost will be above three million dollars. This includes the cost of equipping 400 locomotives, and also 200 multiple-unit electric cars, which will be in service from Philadelphia, southward to Wilmington, Del., and northward to Trenton, N. J.

Attention is called to the fact that (in connection with automatic train control, ordered by the federal government) the cab signals have been in use on other sections of the Pennsylvania for three years or more, and it is stated that on these sections the percentage of perfect trips has been 99.6. The company expects on the New York-Washington line to improve materially on this record, "since," it says in a statement, "the absence of the complicated train control apparatus greatly reduces the probability of failure. The Pennsylvania's experience has shown that probability of obtaining a false 'clear' signal through the cab signal system is so remote as to be virtually an impossibility."



The Wayside signal in the cab—The Pennsylvania has practically completed the installation of the Union continuous cab signal between New York and Washington, D. C. The total cost, which will be over three million dollars, includes the signal equipment for 400 locomotives

Efficiency Trophies on the Central of Georgia

THE CENTRAL OF GEORGIA makes annual recognition of the efforts of employees on the basis of a combined record of safety, efficiency and economy. For 1929 the divisional trophy was won by the Savannah division; it was for very high average prevention of injuries, for conservation of fuel and for elimination of errors in handling freight. The Augusta yard recorded no personal injury for 1041 days.

Of the large agencies, Chattanooga took the trophy for only one error in 914 tons in its work of loading l. c. l. freight; Eufaula took the premium among smaller stations.

The Savannah shops had only three injuries for every million man-hours worked during 1929. For seven years no passenger has been killed or injured on the Central of Georgia.

Supply Trade Notes

C. H. Jensen has joined the engineering staff of the Copperweld Steel Company, Glassport, Pa.

The Bradford Corporation is moving its New York office from 23 West Forty-Third street to 370 Lexington avenue.

The Cleveland Punch & Shear Works Company is celebrating its fiftieth anniversary. The company was established in 1880.

The Ohio Electric & Controller Company, Cleveland, Ohio, has changed its name to the Ohio Electric Manufacturing Company.

J. B. Strong, president of the Ramapo Ajax Corporation, has been appointed an executive member of the Railway Business Association, succeeding Alexander Turner, resigned.

The International Derrick & Equipment Company, Columbus, Ohio, has opened an office in the Grant building, Pittsburgh, Pa. James H. Dye is district manager.

W. M. Stevenson, representative of the Crucible Steel Company of America, with headquarters at Cleveland, Ohio, has been appointed district representative, with headquarters at Rockford, Ill.

Frank B. Hamerly, works manager of the Independent Pneumatic Tool Company, Chicago, with headquarters at Aurora, Ill., has been elected vice-president in charge of manufacturing.

At a recent meeting of the stockholders of Whitman & Barnes Inc., Detroit, Mich., J. L. Holton was elected secretary. Other officers of this company and its subsidiary, the Canadian Detroit Twist Drill Company, Ltd., were re-elected.

The Smith Booth Usher Company, 228 Central avenue, Los Angeles, Cal., has been appointed a representative of Manning, Maxwell & Moore, Inc., to cover the sale of Putnam machine tools in southern California.

G. A. W. Bell, Jr., maintenance inspector on the staff of the chief engineer maintenance of the Baltimore & Ohio, has resigned to enter the sales department of the Northwest Engineering Company, with headquarters at Washington, D. C.

The Thompson Tool & Supply Company, Odd Fellows building, Indianapolis, Ind., now represents the Modern Tool Works division of the Consolidated Machine Tool Corporation of America, in the Indianapolis territory and George H. Diers, 2514 McMicken avenue, Cincinnati, Ohio, has been appointed sales representative in the Cincinnati territory.

The Henry N. Muller Company, First National Bank building, Pittsburgh, Pa., has been appointed district sales agent in western Pennsylvania, eastern Ohio and West Virginia for the Roller-Smith Company, New York.

Morley S. Sloman, a representative of the Sullivan Machinery Company, with headquarters at Pittsburgh, Pa., has been promoted to manager of the Huntington, W. Va., branch office to succeed John S. Walker, Jr., who has retired.

F. A. Lorenz, Jr., assistant vice-president in charge of operations of the American Steel Foundries, Chicago, has been appointed general manager of the Indiana Harbar and Pittsburgh works, in charge of sales and production.

F. A. Lorenz, Jr.

The board of directors of the Armspear Manufacturing Company, New York, at a recent meeting elected the following officers: Arthur G. Johnson, president, C. K. Freeman, assistant to the president and secretary and J. S. Pixley, vice-president and treasurer.

Frank W. Curtis has been appointed research engineer of the Kearney & Trecker Corporation, Milwaukee, Wis., makers of milling machines. Until recently Mr. Curtis was connected with P. R. Mallory & Co., Inc., Indianapolis, Ind., as chief engineer in charge of Carboloy manufacture and developments.

E. R. Norris has been appointed assistant to vice-president of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. He was formerly general works manager and will be responsible for all plant facilities of the company, manufacturing methods, cost reduction and inspection. Mr. Norris has been associated with the Westinghouse Company since 1892.

Wm. G. Harvey Company, 540 First Trust and Deposit building, Syracuse, N. Y., has been appointed sales representative of the Modern Tool Works division of the Consolidated Machine Tool Corporation of America in the Syracuse and Buffalo territories.

The Chicago Pneumatic Tool Company, New York, has opened a branch office at 327 Philcade building, Tulsa, Okla. George J. Lynch has been appointed district manager in charge of this office and the territory it serves. The company recently opened an office and service station at 1 West Sixteenth street, Oklahoma City, Okla.

Harry B. Loder, for the past two years with the New York sales office of the Wrought Iron Company of America, has been transferred to the general office at Lebanon, Pa., and will represent the company in eastern Pennsylvania, the territory formerly covered by George H. Clymer, who has been appointed district sales manager at Philadelphia.

W. George Cook has been appointed special railroad representative of the Lunkenheimer Company, Cincinnati, Ohio. Mr. Cook's headquarters are at Chicago. He was for several years connected with the Garlock Packing Company as railroad representative and manager of its Chicago and Philadelphia branches. For the past three years he has been assistant sales manager of the New Jersey Asbestos Company, in charge of industrial sales.

Frederick V. Green, formerly vice-president of the Pittsburgh Testing Laboratory has joined the force of the Triplex Safety Glass Company, Clifton, N. J., makers of laminated glass in all its forms from aeroplane to bullet proof. Mr. Green will handle the railway business in the eastern territory with headquarters at 32 West Fortieth street, New York. Mr. Green is also a special representative of the Gameville Company, Newton Upper Falls, Mass., makers of fire alarm apparatus.

A re-organization of the Standard Steel Car Company and the consolidation of the new company with Pullman Incorporated, became effective on March 1. The officers of the new company, the Standard Steel Car Corporation, are as follows: P. H. Joyce, president; R. L. Gordon, vice-president; P. G. Jenks, vice-president; C. P. Stembel, vice-president; B. P. Newton, vice-president and comptroller; William Bierman, secretary and general manager; J. A. Mountain, assistant secretary; C. L. Spence, treasurer; and C. B. McMillan, assistant treasurer.

George B. Powell has been appointed district sales manager of the American Locomotive Company and the Railway Steel-Spring Company with headquarters at Syndicate Trust building, St. Louis, Mo. Mr. Powell has had a long experience in the railway supply and manufacturing field in the St. Louis district. For over

twenty years he was located at the St. Louis plant of the Railway Steel-Spring Company, leaving the position of manager of the plant in 1925 to become sales agent of the company in that district. He now also succeeds to the position left vacant by the death in February of Edward C. Fisher.

THE NILES TOOL WORKS COMPANY, Hamilton, Ohio, now has direct sales offices at Chicago, Detroit, New York and Pittsburgh. The Chicago office, located in the Chicago Daily News building, is in charge of A. C. Wais, western manager, and associated with Mr. Wais are F. T. McDonough and W. R. Mullinix. The Chicago office also directs sales in the St. Louis territory. B. A. Donahue continues to represent the company in that territory, with office in the Railway Exchange building. The Detroit territory is in charge of G. R. Shields who was formerly at the Hamilton plant; Mr. Shields has his headquarters in the Curtis building. The Pittsburgh territory continues to be served by P. C. McBeth, Pittsburgh manager and L. McConnell, with offices in the Grant building. The Pittsburgh office directs the sales in the Cleveland territory and this territory is served by C. A. Tankred with office in the Schoffield building. The New York office in the New York Central building is in charge of D. S. Woods, eastern manager. S. M. Matchett and J. A. Ross are associated with Mr. Woods. Mr. Ross will continue to handle the Philadelphia territory with office in the Widener building. The Cincinnati territory is handled from the general offices at Hamilton; the general sales work in connection with railroad tools is under the supervision of A. T. Kuehner at Hamilton. Sales agents have been appointed as follows: The C. F. Bulotti Machinery Company, San Francisco, Cal; Hallidie Machinery Company, Seattle, Wash.; D. S. Mair Machinery Corporation, Houston and Dallas, Texas. The southeastern territory will be handled by Pratt & Whitney Company and L. A. Quinn, Birmingham, Ala.

AT A MEETING of the executive committee of the board of directors of the American Locomotive Company at New York on February 6, Joseph Davis, vice-president and comptroller, was appointed executive vice-president, and F. Pierce Brent, assistant comptroller, was appointed comptroller. Mr. Davis was born and educated at Albany, N. Y. He was employed by the Delaware & Hudson and the New York Central and entered the employ of the American Locomotive Company at the time of its formation in 1901. He was appointed comptroller in October, 1909, becoming vice-president and comptroller on January 17, 1917. Mr. Brent was born at Onancock, Va., and was educated at Richmond. He entered the service of the American Locomotive Company at the Richmond plant in 1907 and was transferred to the general accounting department in New York in 1911. On December 1, 1917, he was appointed general shop accountant and was appointed assistant comptroller on October 1, 1928.

NELSON L. REHNQUIST, who has been elected vice-president of the St. Louis Car Company, entered the employ of the Milwaukee Electric Railway & Light Company as a messenger boy in 1907, and in 1911 became associated with the St. Louis Car Company. He held various positions until 1916 when he was made purchasing agent. A year ago, when the company entered the airplane construction field, his jurisdiction was extended over that branch. As vice-president, he will continue to have charge of the aviation and purchasing departments. Howard R. Gass, who also has been elected vice-president of the St. Louis Car Company, with jurisdiction over the sales department, was at one time a field engineer for Paret & Beard, consulting engineers at Kansas City, Mo., in which capacity he made basic surveys and estimates for the Wichita, Kan., terminals and had charge of the subway and viaduct construction of the third division of the Kansas City Terminals Railways. Later he was field engineer for the North Kansas City Development Company. He has also been associated with the Kansas City Southern, the Missouri-Kansas-Texas, the Chicago, Rock Island & Pacific, the St. Louis-San Francisco and the New York Central as a locating and construction engineer. From 1914 to 1921, he was railroad inspection and valuation engineer for the Missouri Public Service Commission where he had charge of the field operations in connection with valuation cases. On May 1, 1921, he was appointed sales manager of the St. Louis Car Company, which position he has held until his recent promotion.

Obituary

FRANK DEVAULLE FENN, who previous to 1919 was general manager of the railroad sales department of the Crane Company, Chicago, died at his home in Chillicothe, Ill., on March 3. Mr. Fenn was born on November 11, 1866, at Marcellus, Mich., and received his education in the Kansas State Normal School at Emporia, Kan. He entered the service of the Atchison, Topeka & Santa Fe at the age of 19 and assisted in the building of the line from Kiowa, Kan., to Amarillo, Tex. He subsequently served for eight years as locomotive fireman and engineman. Mr. Fenn entered the employ of the Crane Company in April, 1893, as traveling engineer, railroad air brake department. He represented the firm and was also in charge of its exhibits at the Columbian exposition in Chicago in 1893 and at the St. Louis exposition in 1904. He subsequently was appointed general manager of the railroad sales department and retired from active service on account of ill health in June, 1919. Mr. Fenn was one of the organizers of the Railway Equipment Manufacturers' Association which is associated with the Traveling Engineers' Association, and was for 27 years an active member of both organizations.

Frank DeVaulle Fenn

H. D. HAMMOND, vice-president of the American Steel Foundries, with headquarters at Chicago, died on March 1 of peritonitis following an operation for appendicitis. Mr. Hammond was born in 1887, and during his early training spent four years in the offices of Robert Wetherill & Co., Corliss engine manufacturers at Chester, Pa., and one year with the Keystone Drop Forge Works at the same point, entering the service of the American Steel Foundries at the Thurlow, Pa., works in September, 1906. In March, 1910, he was transferred to the Pittsburgh, Pa., sales office and three years later he was appointed production engineer at the Indiana Harbor, Ind., works. Mr. Hammond was promoted to manager of railroad miscellaneous sales at Chicago in March, 1915.

H. D. Hammond

J. H. WEISBROD, assistant vice-president of the American Car & Foundry Company, died at his home in Brooklyn, N. Y., on March 6, after a short illness, at the age of 50 years. Mr. Weisbrod spent 30 years in the service of the American Car & Foundry Company, starting in 1901 as draftsman and estimator in the mechanical division, western department, at St. Louis, Mo. He succeeded to the office of mechanical engineer and continued in this capacity at St. Louis until January, 1918, when he was transferred to the New York office as assistant to the general manager. In December, 1923, he was promoted to assistant vice-president.

Personal Mention

General

A. W. Byron, master mechanic of the Philadelphia Terminal division of the Pennsylvania succeeds B. M. Swope as superintendent of motive power, Central Pennsylvania division. Mr. Byron was born on January 3, 1880, at Buffalo, N. Y. He entered the service of the Pennsylvania as a draftsman in the Buffalo shops on December 3, 1899. On January 1, 1906, he was advanced to the position of assistant master mechanic at Olean, N. Y., and on November 21, 1912, he was appointed master mechanic in the South Pittsburgh shops. Mr. Byron was promoted to the position of master mechanic of the Philadelphia Terminal division on February 1, 1928.

H. W. Jones, superintendent of motive power of the Western Pennsylvania division of the Pennsylvania, has been appointed general superintendent of motive power of the Central region, succeeding R. H. Flinn, promoted. Mr. Jones was born on December 30, 1884, at Northumberland, Pa. He entered the service of the Pennsylvania as a machinist apprentice in the Sunbury shops, on July 1, 1903. After holding various positions in the maintenance of equipment department, he was appointed assistant master mechanic at Wilmington, Del., in November, 1917, and in December, 1921, was advanced to the position of master mechanic at the Juniata Shops, Altoona, Pa. On June 16, 1929, Mr. Jones was appointed superintendent of motive power of the Western Pennsylvania division.

B. M. Swope, now superintendent of motive power of the Central Pennsylvania division, will succeed H. W. Jones, promoted, as superintendent of motive power of the Western Pennsylvania division of the Pennsylvania. Mr. Swope was born on June 13, 1884, at Altoona, Pa. He was graduated from Lehigh university in 1907. On July 1, 1908 he entered the service of the Pennsylvania as a special apprentice at Altoona. After experience in maintenance of equipment work, he was made assistant master mechanic of the Renovo division in March, 1917, and in May, 1923, was appointed assistant engineer of motive power at St. Louis, Mo. On April 1, 1928, Mr. Swope was advanced to the position of superintendent of motive power of the Central Pennsylvania division, with headquarters at Williamsport, Pa.

R. H. Flinn, general superintendent of motive power of the Central region of the Pennsylvania, with headquarters at Buffalo, N. Y., has been appointed general superintendent of the Western Pennsylvania division, with headquarters at Pittsburgh, Pa., succeeding J. H. Redding, deceased. Mr. Flinn was born on March 8, 1887, at Camden, N. J., and entered railway service on July 1, 1902, as assistant draftsman in the Camden, N. J., shops of the Pennsylvania. He became locomotive fireman on the West Jersey & Seashore, operated by the Pennsylvania, in June, 1906, and was transferred to the Columbus, Ohio, shops as special apprentice on June 28, 1909. From February, 1911, until June, 1912, he was engaged in special work for the general superintendent of motive power at Pittsburgh, and from the latter date until May, 1913, was motive power inspector in the office of the superintendent of motive power at Columbus. He was general foreman at Louisville, Ky., from May, 1913, to January, 1915, and was then transferred in the same capacity to Bradford, Ohio, where he remained until June, 1916. Mr. Flinn served as assistant master mechanic at Allegheny, Pa., from June, 1916, until November, 1917, and then became assistant engineer of motive power at Toledo, Ohio, which posi-

R. H. Flinn

tion he held until July, 1918, when he became master mechanic at Terre Haute, Ind. He served in this capacity successively at Indianapolis,Ind., and at Columbus, Ohio. In June, 1928 he was appointed superintendent of motive power, western Pennsylvania division, and a year later general superintendent of motive power of the Central region.

William T. Westall, who has been promoted to special assistant superintendent of rolling stock of the New York Central, lines west of Buffalo, N. Y., with headquarters at Cleveland, Ohio, has been connected with that road for more than 23 years. He was born on July 16, 1878, at Cleveland, Ohio, and entered railway service in September, 1896, as a helper in the Cleveland shops of the Erie. Two years later he was promoted to car foreman at Youngstown, Ohio, where he remained until April, 1900, when he was appointed wreck master at Cleveland. In April, 1902, Mr. Westall became a special shop clerk on the Lake Shore & Michigan Southern (now part of the New York Central) at the Cleveland shops and in January, 1903, was appointed car foreman on the Lake Erie, Alliance & Wheeling (now part of the New York Central) at Alliance, Ohio. From November, 1906, to July, 1925, he served successively as inspector at the Collinwood (Ohio) car shops of the New York Central, piece work inspector, assistant foreman, foreman of the freight car shop, division general foreman of the Third district, supervisor of car repairs for the United States Railroad Administration and special in-

William T. Westall

spector on the staff of the general superintendent of rolling stock of the New York Central. Mr. Westall was then promoted to assistant master car builder, with headquarters at Toledo, Ohio, being further promoted to master car builder of the Third district, with headquarters at Collinwood, on March 1, 1929. He is now special assistant superintendent of rolling stock.

Car Department

E. G. Holtam, foreman freight car repairs of the Southern at Birmingham, Ala., has been appointed coach yard foreman.

J. H. Dorough has been appointed assistant foreman freight car repairs of the Southern, with headquarters at Birmingham, Ala.

John T. Fritchman, car inspector of the Atchison, Topeka & Santa Fe at Wellington, Kan., has been promoted to the position of car foreman.

A. R. Pryor, car foreman of the Chicago, Rock Island & Pacific at Hutchison, Kan., has been transferred to the position of car foreman at Chickasha, Okla.

B. M. Walker, coach yard foreman of the Southern at Birmingham, Ala., has been transferred to Ludlow, Ky., as foreman of the coach department at that point.

C. Yarborough, general foreman car repairs of the Southern at Meridian, Miss., has been appointed general foreman car repairs, with headquarters at Chattanooga, Tenn.

George E. Mitchell, assistant car foreman of the Atchison, Topeka & Santa Fe at Dodge City, Kan., has been transferred to the position of assistant car foreman at Hutchinson, Kan.

ROY GARNETT, coach foreman of the Southern at Ludlow, Ky., has been appointed car department foreman, with headquarters at Cincinnati, Ohio, succeeding D. M. McGrath, deceased.

J. G. HUTTASH, car inspector of the Chicago, Rock Island & Pacific, has been promoted to the position of car foreman, with headquarters at Hutchinson, Kan.

W. F. GILLIAM, assistant foreman freight car repairs of the Southern at Birmingham, Ala., has been promoted to the position of foreman freight car repairs.

G. A. HARRIS, general foreman car repairs of the Southern at Chattanooga, Tenn., has been appointed general foreman car repairs, with headquarters at Meridian, Miss.

Master Mechanics and Road Foremen

RICHARD KLING has been appointed master mechanic of the Missouri-Illinois, at Boone Terre, Mo.

G. E. DAILEY has been appointed acting master mechanic of the Toledo, Peoria & Western, with headquarters at Peoria, Ill.

J. WADE has been appointed road foreman of engines, Coster division, of the Southern, succeeding W. E. Preston, deceased.

J. W. KEPPEL, master mechanic of the Canadian Pacific, with headquarters at Edmonton, Alta., has been transferred to a similar position on the Brandon division.

THE JURISDICTION of A. R. Sykes, master mechanic of the Southern Kansas division of the Missouri Pacific, with headquarters at Coffeyville, Kan., has been extended to include the Central division.

DON NOTT, assistant master mechanic of the Chicago, Burlington & Quincy at Galesburg, Ill., has been transferred to the Hannibal division, with headquarters at Brookfield, Mo., to succeed H. E. Felter.

H. C. GUGLER, master mechanic of the Hannibal division of the Chicago, Burlington & Quincy at Hannibal, Mo., has been appointed superintendent of shops with headquarters at West Burlington, Iowa.

W. D. HARTLEY, master mechanic of the New Mexico division of the Atchison, Topeka & Santa Fe at Raton, N. M., has been promoted to the position of mechanical superintendent of the Northern district of the Western lines, with headquarters at La Junta, Colo. succeeding J. R. Sextion, who has retired from active duty under the railroad's pension plan after 18 years as mechanical superintendent at La Junta.

H. E. FELTER, assistant master mechanic of the Hannibal division of the Chicago, Burlington & Quincy at Brookfield, Mo., has been promoted to master mechanic of the Casper division, with headquarters at Casper, Wyo., succeeding C. E. Melker.

C. E. MELKER, master mechanic of the Casper division of the Chicago Burlington & Quincy at Casper, Wyo., has been transferred to the position of master mechanic of the Hannibal division, with headquarters at Hannibal, Mo. Mr. Melker succeeds H. C. Gugler.

O. B. CAVANAUGH, who has been appointed master mechanic of the Northwestern Pacific with jurisdiction over the motive power and car departments, including the maintenance of interurban electric car equipment, was born on July 16, 1883, at Baldwin, Mich. He completed his studies at the Baldwin high school in 1900 and immediately after began car building and structural iron work in the employ of the Russel Wheel & Foundry Company. He was in train service and also served in the locomotive shops of the Mason & Oceana during 1903 and 1904, and during the latter part of 1904 and early in 1905 was employed in steel car building and locomotive shop work for the U. S. Government at Ft. Stevens, Ore. He then became engaged in train service work on the Chicago, Burlington & Quincy, and in 1906 entered the employ of the Pere Marquette, doing track work. In 1907 he was engaged in general shop work for the Grand Rapids Street Railway, and in 1909 became a machine operator in saw mills at Klamath Falls, Ore., returning to the shops of the Grand Rapids Street Railways in October, 1910. In 1911 he became an inspector and foreman in the mechanical department of the Southern Pacific and in September, 1913, was appointed an inspector for the Northwestern Pacific. From April, 1916, until July 1, 1918, he was in train service, with the exception of the winter months of 1917-1918 when he was engaged in ship building. He was appointed car foreman of the Northwestern Pacific on July 1, 1918, and from September, 1922, until his appointment as master mechanic at Tiburon, Cal., was master car repairer for the system.

Shops and Enginehouse

LOUIS A. NORTH, superintendent of the Burnside shops of the Illinois Central at Chicago, has retired from active duty after 28 years of service.

A. R. HOEHN, day enginehouse foreman of the Alabama Great Southern, has been appointed machinist supervisor, with headquarters at Birmingham, Ala.

ROY WHITE, a machinist, has been promoted to the position of enginehouse foreman of the St. Louis-San Francisco, with headquarters at Fort Scott, Kan.

JOHN T. CAWLEY has been appointed assistant foreman boilermaker of the Southern, with headquarters at South shop, Atlanta, Ga.

R. E. RABUN, assistant night foreman of the Southern at Danville, Ky., has been appointed day enginehouse foreman, with headquarters at the Ferguson shop, Somerset, Ky.

R. B. WHEELER, day enginehouse foreman at the Ferguson shop of the Southern at Somerset, Ky., has been appointed day enginehouse foreman at the Finley shop, Birmingham, Ala.

E. E. SKELTON, a machinist at the Ferguson shop of the Southern at Somerset, Ky., has been promoted to the position of assistant night foreman, with headquarters at Danville, Ky.

A. C. REEVES, general foreman at the West Side locomotive shops of the St. Louis-San Francisco at Springfield, Mo. has been promoted to the position of superintendent of shops, succeeding J. W. Surles.

E. L. BURFITT, day enginehouse foreman at the Finley shop of the Southern at Birmingham, Ala., has been appointed day enginehouse foreman of the Alabama Great Southern, with headquarters at Birmingham.

V. FAGAN, night enginehouse foreman of the Kansas City Southern at Kansas City, Mo., has been promoted to the position of general enginehouse foreman, with headquarters at Pittsburg, Kan., succeeding C. F. Parker, deceased.

Purchases and Stores

P. E. WELCH has been appointed district storekeeper on the Southern Pacific Lines in Texas and Louisiana, with headquarters at Algiers, La., succeeding N. Feigel.

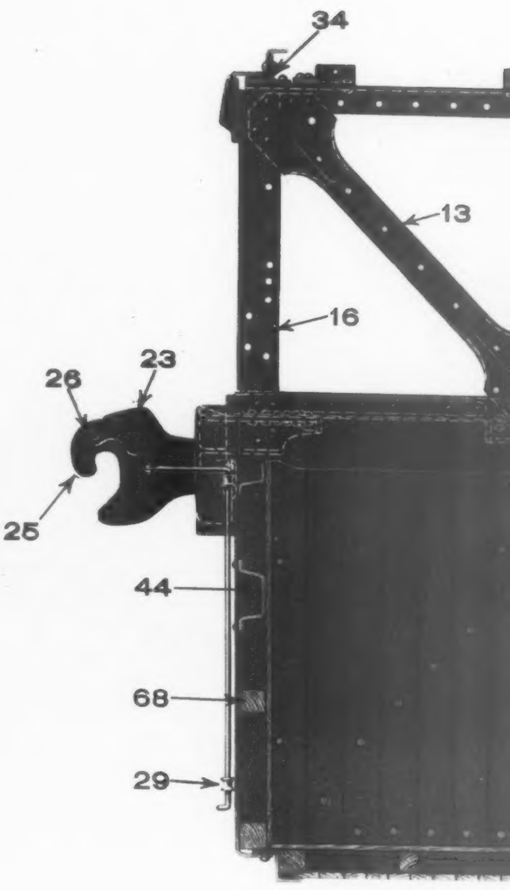
W. E. RAWSON, district storekeeper of the Southern Pacific Lines in Texas and Louisiana, at Houston, Tex., has been promoted to the position of assistant general storekeeper, with headquarters at Houston.

FRANK W. TAYLOR, purchasing agent of the Southern Pacific, has been promoted to the position of general purchasing agent, with headquarters as before at San Francisco, Cal.

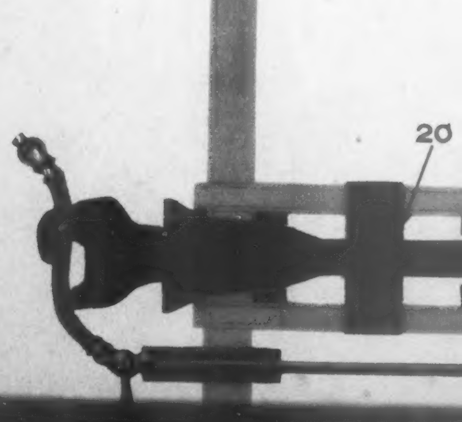
THE JURISDICTION of G. D. Tombs, division storekeeper of the Illinois Central at Memphis, Tenn., has been extended to include all material heretofore handled by the Grenada (Miss.) storehouse, succeeding W. A. Prather, who has been assigned to other duties.

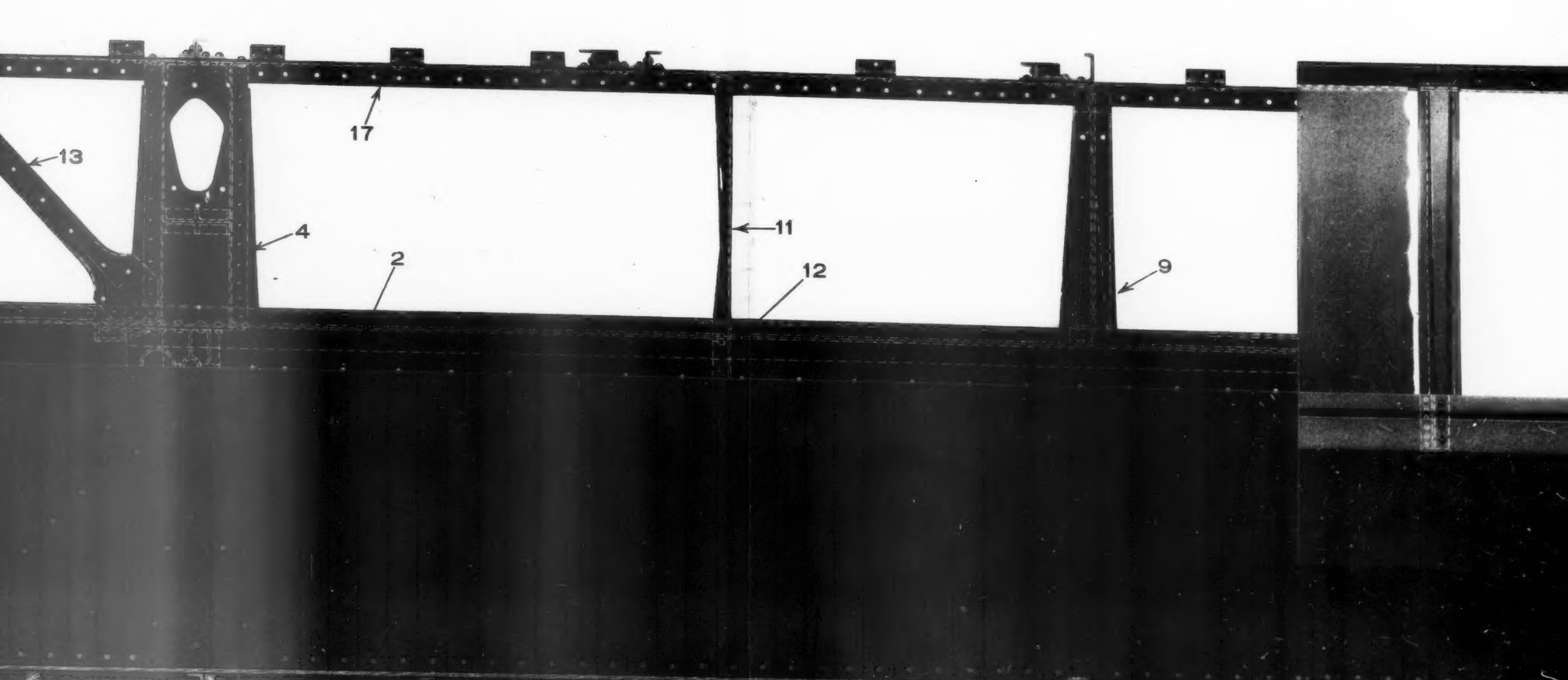
Obituary

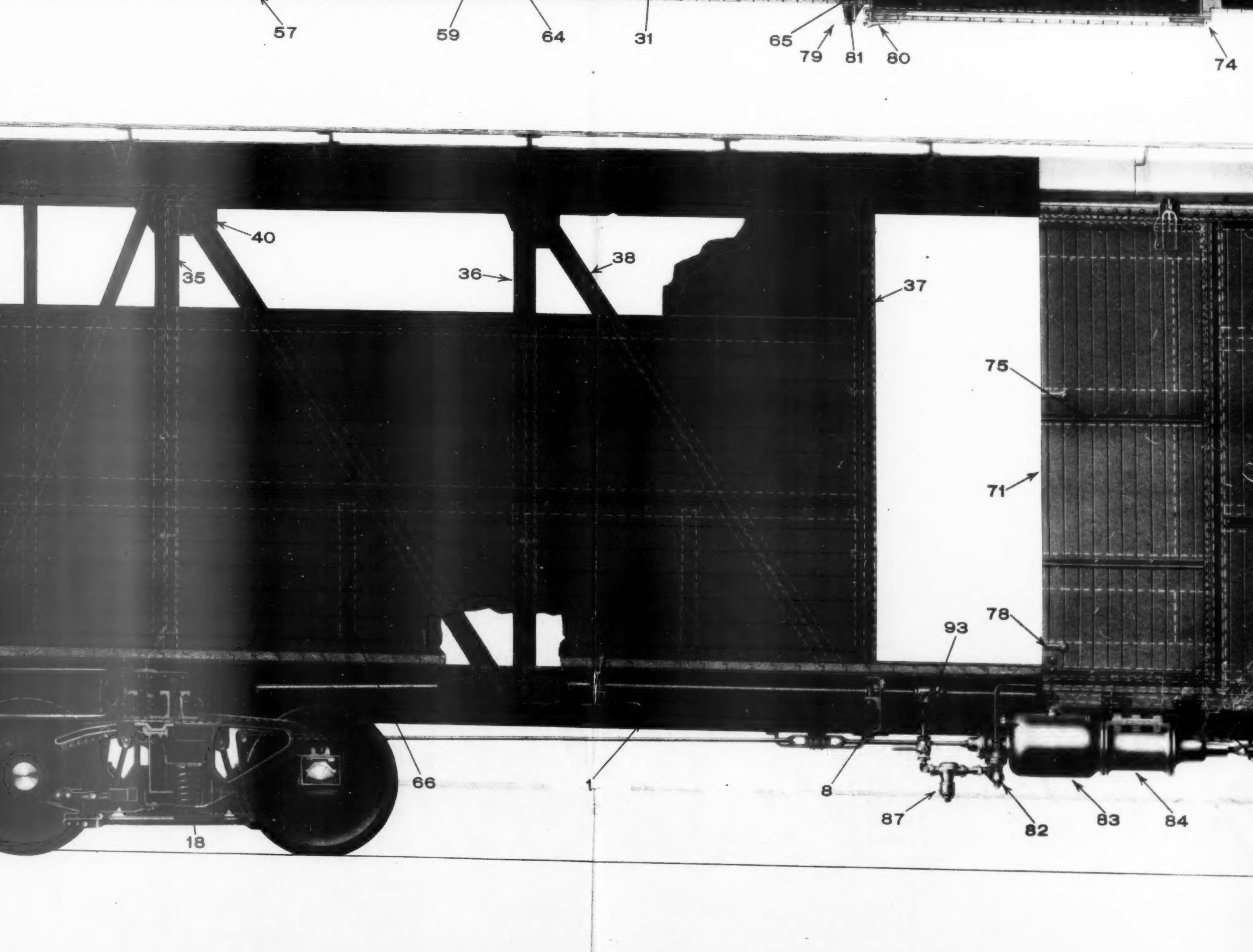
C. M. HITCH, district master car builder of the Baltimore & Ohio, with headquarters at Cincinnati, Ohio, died on March 4, from heart trouble.

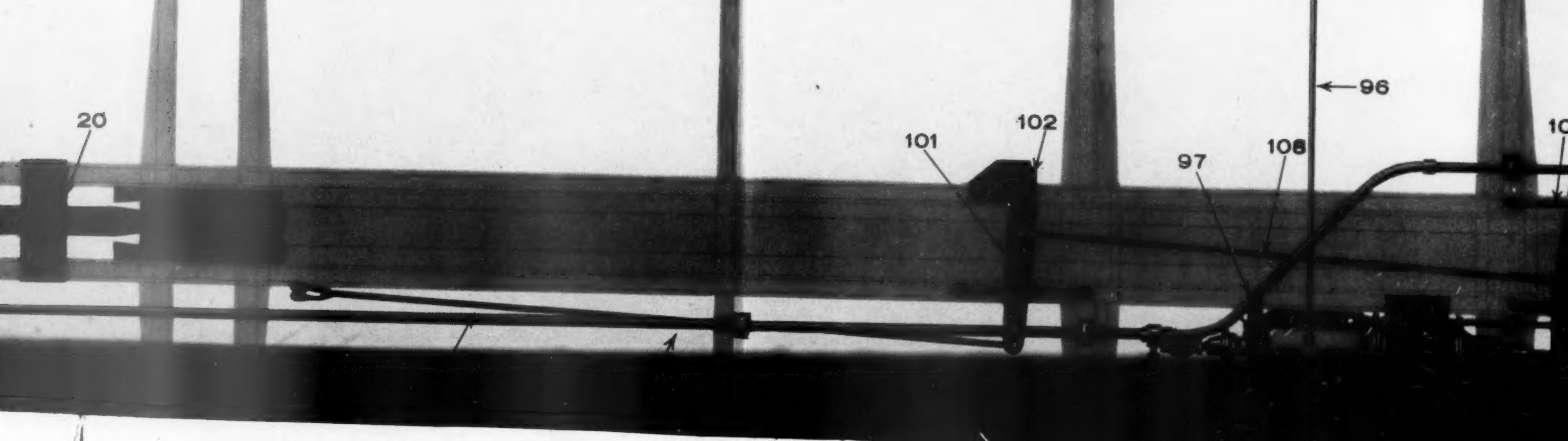

34
13
16
26
23
25
44
68
29

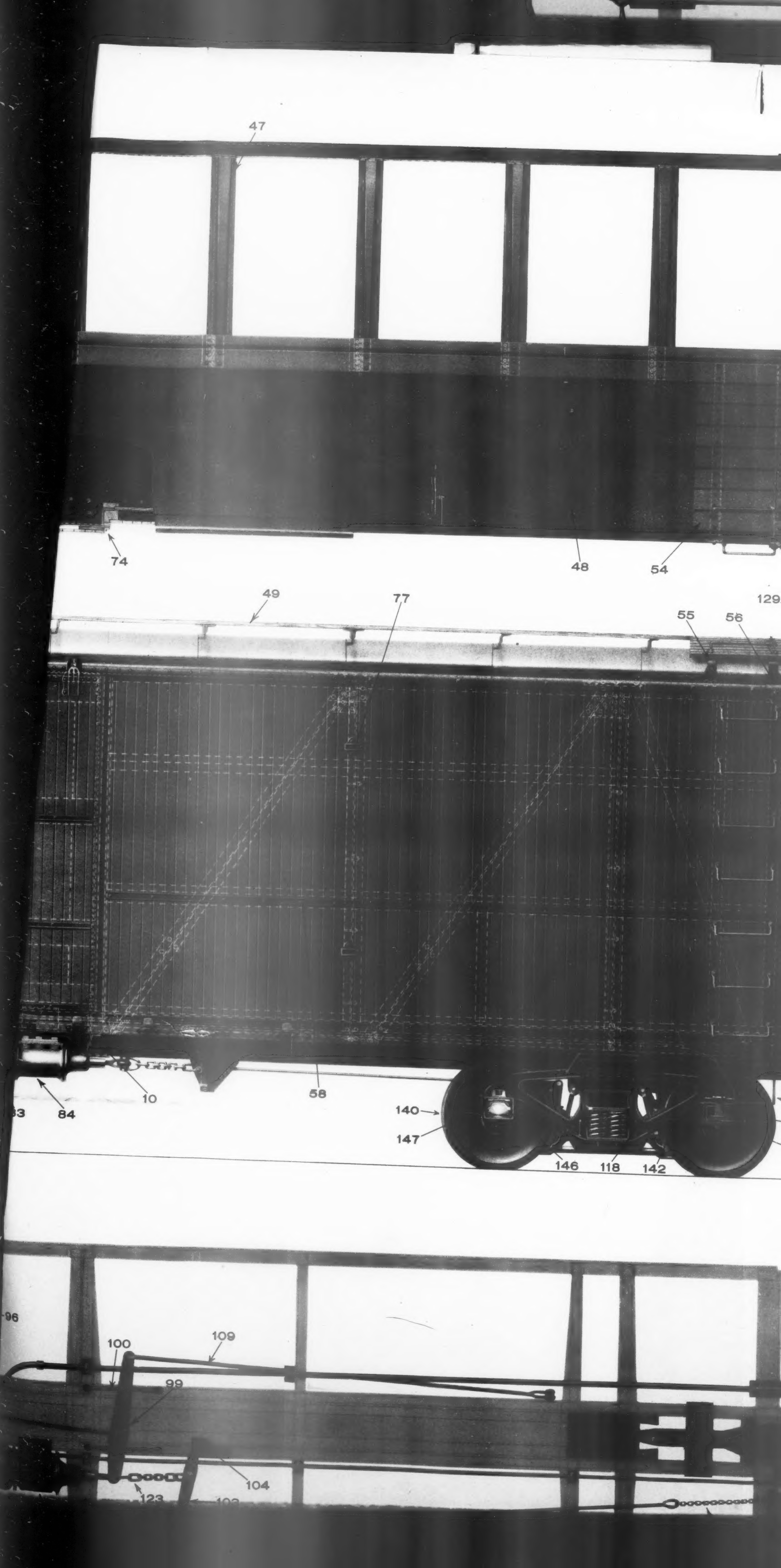

43
52
30
19
22
21

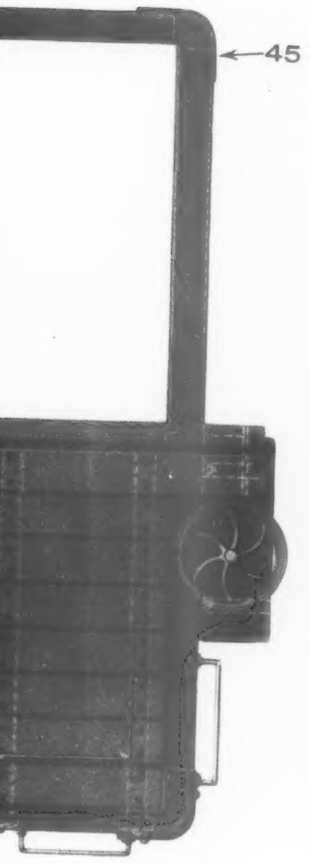

20

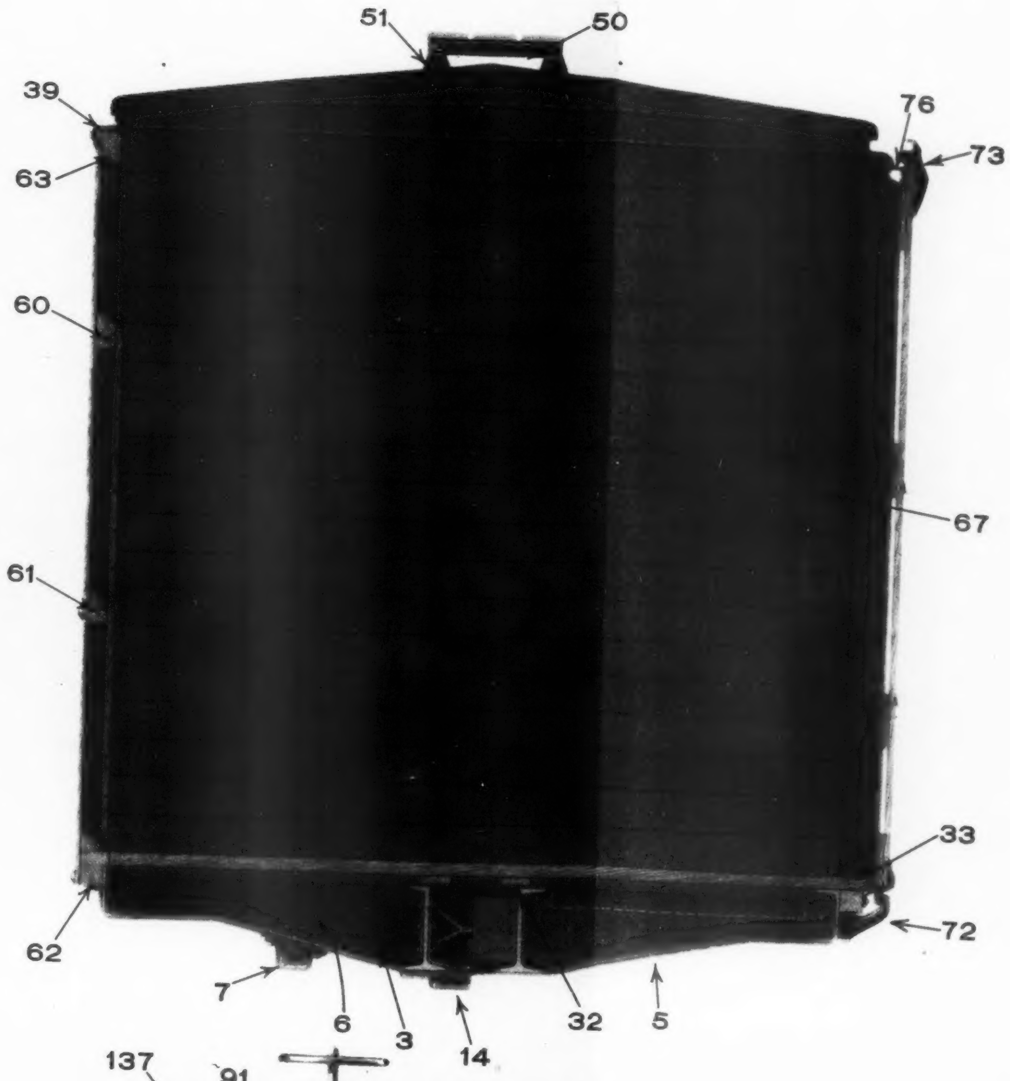

17
13
4
11
2
12
9
57
59
64
31
65
79
81
80
74


40
35
36
38
37
75
71
93
78
66
1
8
87
82
83
84
18

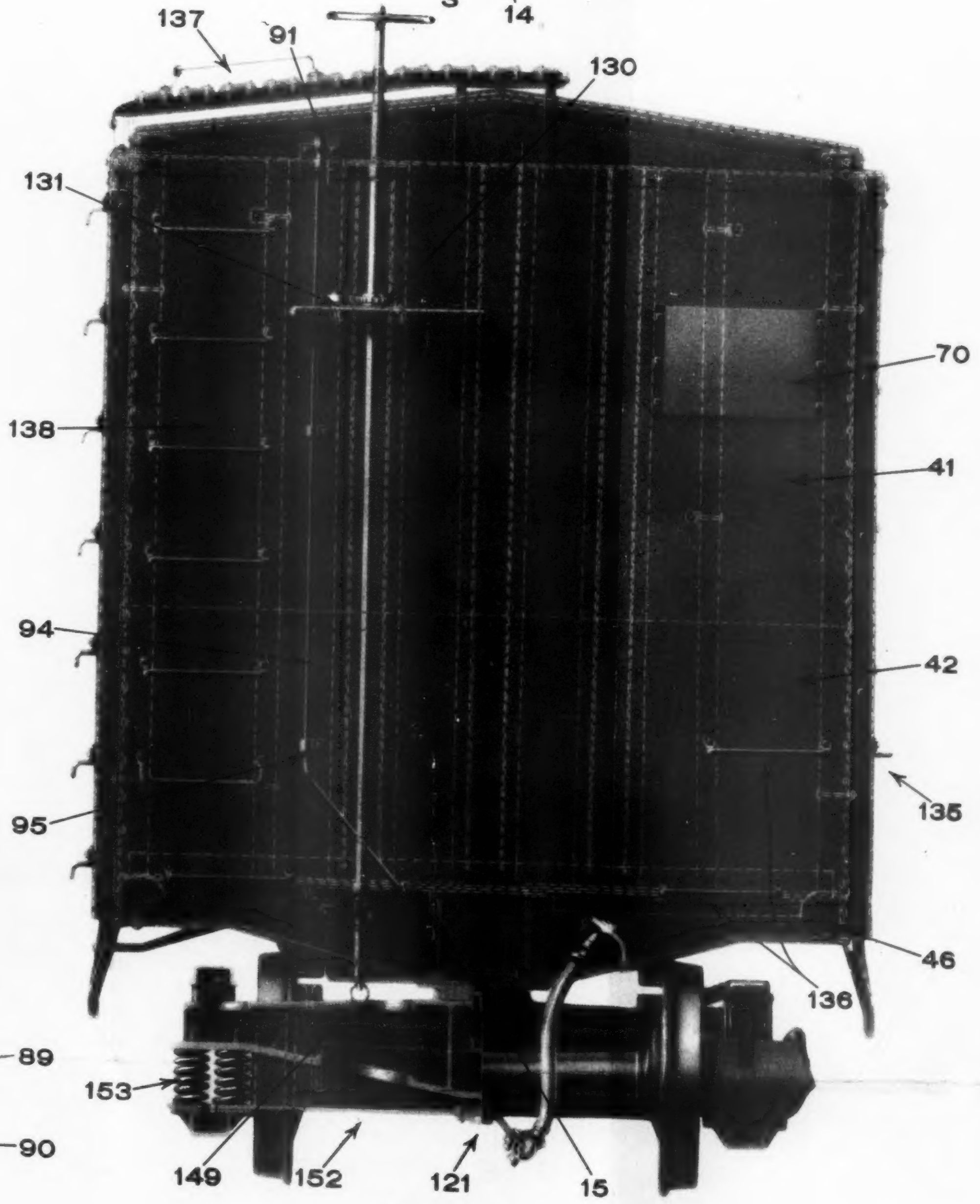

96
20
101
102
97
108

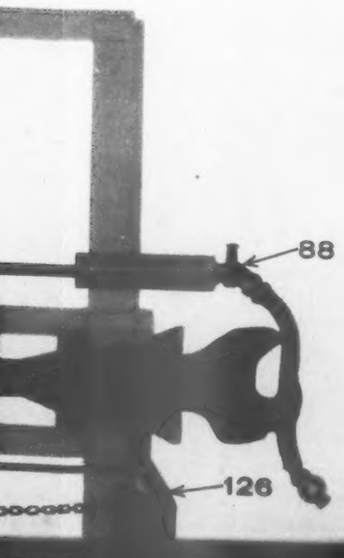

47
74
48
54
49
77
129
55
56
10
58
84
140
147
146
118
142
96
100
109
99
104
123

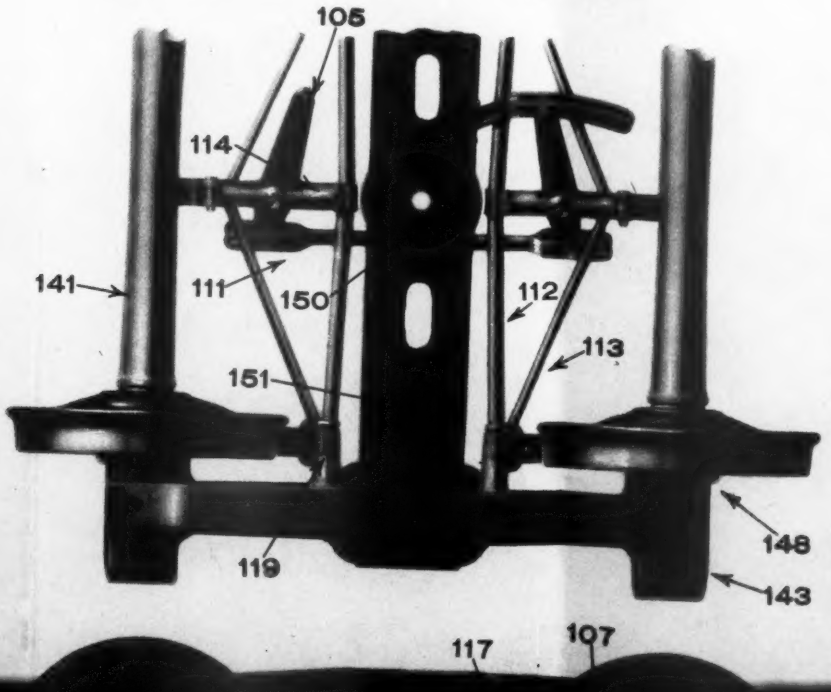

45

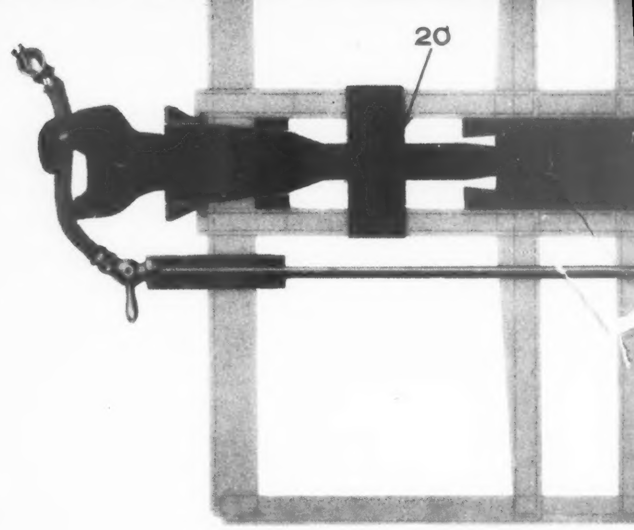

51
50
39
76
73
63
60
67
61
33
72
62
7
6
3
14
32
5


129
56
53
132
133
127
139
28
27
24
134
145
89
144
90


137
91
130
131
70
138
41
94
42
135
95
46
136
153
149
152
121
15


88
126


105
114
141
111
150
112
113
151
148
119
143
117
107

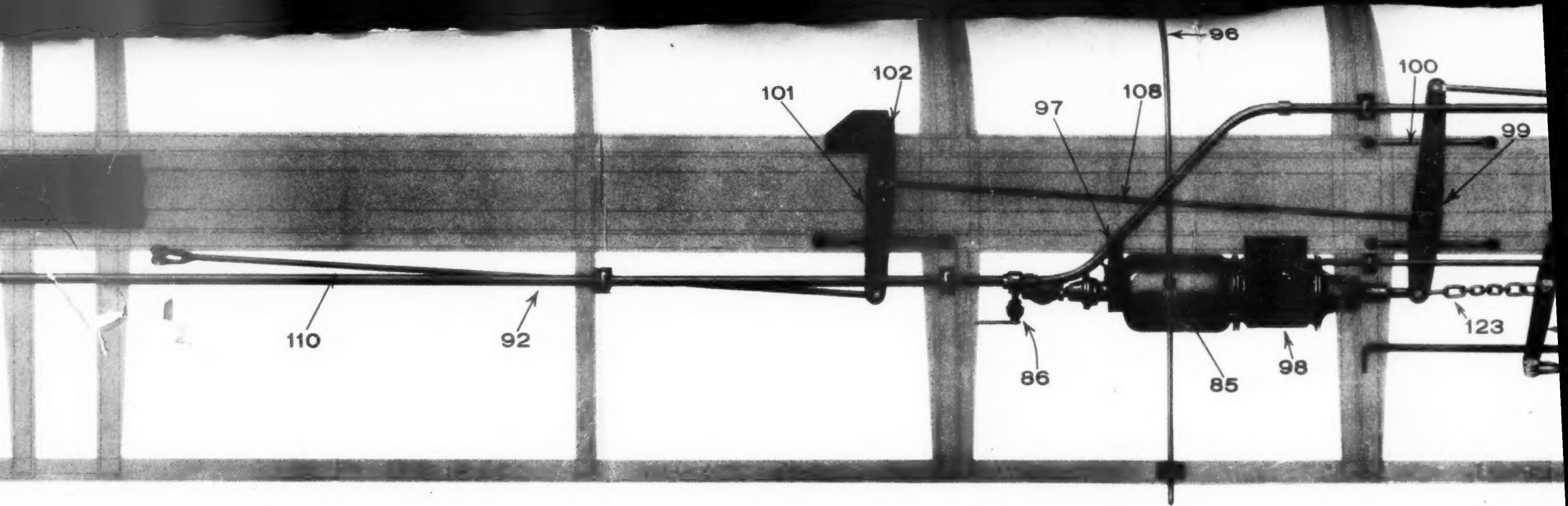


Anato

UNDERFRAME WITH
DRAFT GEAR

1—Center sill
2—Center-sill cover plate
3—Bolster diaphragm
4—Bolster-diaphragm top cover plates
5—Bolster-diaphragm bottom cover plates
6—Bolster side-bearing filler
7—Body side bearing
8—Cross-bearer diaphragm
9—Cross-bearer top cover plates
10—Cross-bearer bottom cover plates
11—Crosstie diaphragm
12—Center sill spacer

13—Dı
14—Bo
15—Co
16—En
17—Si
18—Bo
ge
19—St
st
20—D
21—D
22—D
23—Co
24—Co
25—Co
26—Co
27—Co
28—Ur



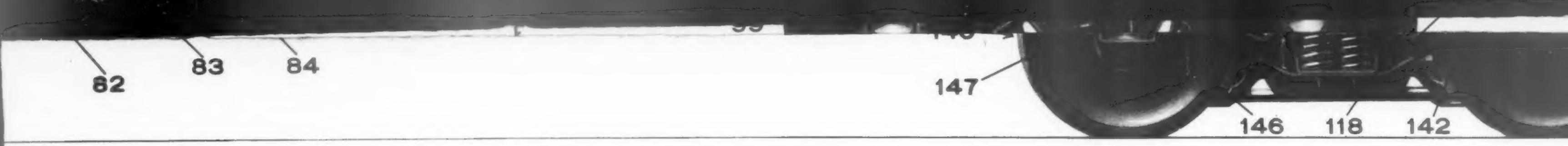
atomy of an A.R.A. Standard Do

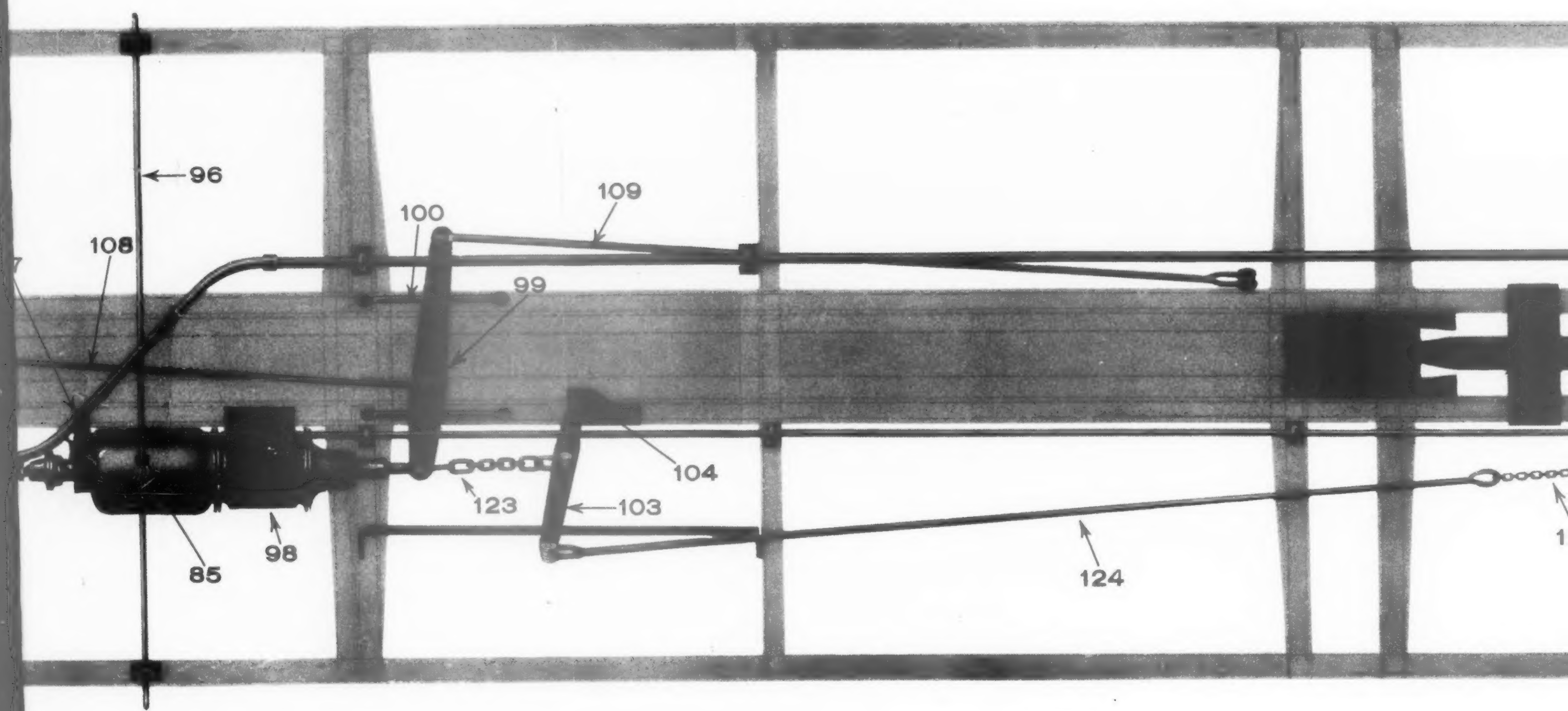
13—Diagonal brace to corner
14—Body center plate
15—Center-pin hole
16—End sill
17—Side sill
18—Bolster filler and rear draft-gear lug.
19—Striking casting, draft-gear stop and coupler carrier.
20—Draft-gear carrier
21—Draft-gear yoke
22—Draft-gear key
23—Coupler head
24—Coupler horn
25—Coupler knuckle
26—Coupler-knuckle pin
27—Coupler-lock lifter
28—Uncoupling lever
29—Uncoupling-lever bracket
30—Space for draft gear
31—Flooring
32—Floor nailing strip
33—Threshold plate

SUPERSTRUCTURE

34—Corner post
35—Bolster post
36—Intermediate post
37—Door post
38—Diagonals
39—Side plate
40—Connections for posts and diagonals.
41—Steel end top sheet
42—Steel end bottom sheet
43—End plate
44—End post
45—Flashing for corner post and end plate
46—Push pole pocket
47—Roof carline
48—Roof sheets
49—Running board, longitudinal
50—Running-board saddle
51—Running-board clip
52—Running-board end bracket
53—Running-board angle
54—Running board, latitudinal
55—Latitudinal running - board supports
56—Latitudinal running - board brackets
57—Sheathing, Outside
58—Sheathing band
59—Side lining
60—Belt rail, Upper
61—Belt rail, Lower
62—Side-sill filler
63—Side-plate filler
64—Side-post fillers
65—Door-post filler
66—Cripple post
67—End lining
68—End-lining nailing piece
69—Defect and routing board (Not shown)
70—Placard board
71—Side door
72—Side-door bottom guide
73—Side-door hanger
74—Side-door protection strip
75—Side-door stiffener

Rail
Mechanical





tandard Double-Sheathed Ste

post and

gitudinal
le

bracket
e
udinal
- board

- board

59—Side lining
60—Belt rail, Upper
61—Belt rail, Lower
62—Side-sill filler
63—Side-plate filler
64—Side-post fillers
65—Door-post filler
66—Cripple post
67—End lining
68—End-lining nailing piece
69—Defect and routing board (Not shown)
70—Placard board
71—Side door
72—Side-door bottom guide
73—Side-door hanger
74—Side-door protection strip
75—Side-door stiffener

76—Side-door top track
77—Door stop
78—Door handle
79—Door hasp
80—Door-hasp fastener
81—Door-hasp bracket

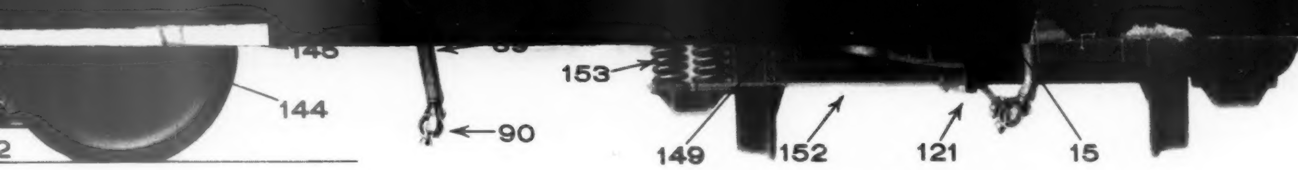
AIR BRAKE AND BRAKE GEAR

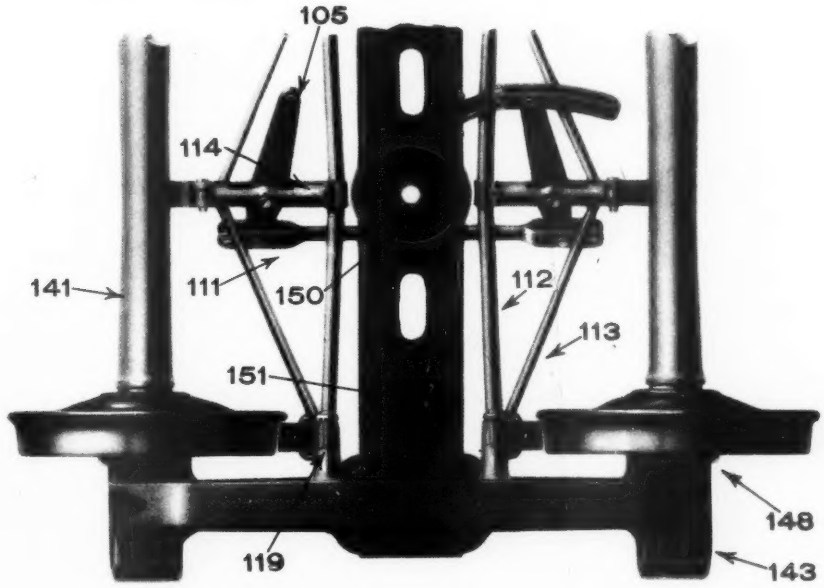
82—Triple valve
83—Auxiliary reservoir
84—Brake cylinder
85—Release valve
86—Cut-out cock
87—Dust collector
88—Angle cock
89—Brake hose
90—Hose coupling
91—Pressure-retaining valve

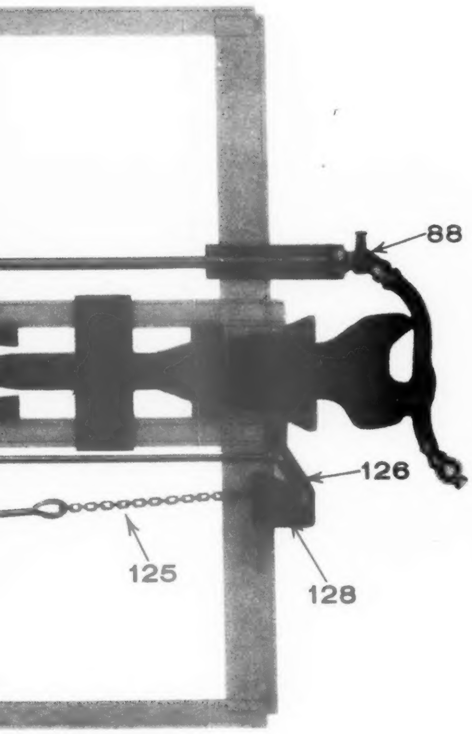
92—Brake pipe
93—Branch pipe
94—Retaining-valve pipe
95—Retaining-valve pipe bracket
96—Release rod
97—Reservoir support
98—Brake-cylinder support
99—Cylinder lever
100—Cylinder-lever guide
101—Floating lever
102—Floating-lever fulcrum
103—Hand-brake lever
104—Hand-brake lever fulcrum
105—Live truck lever
106—Dead truck lever
107—Dead lever fulcrum
108—Cylinder and floating-lever connecting rod

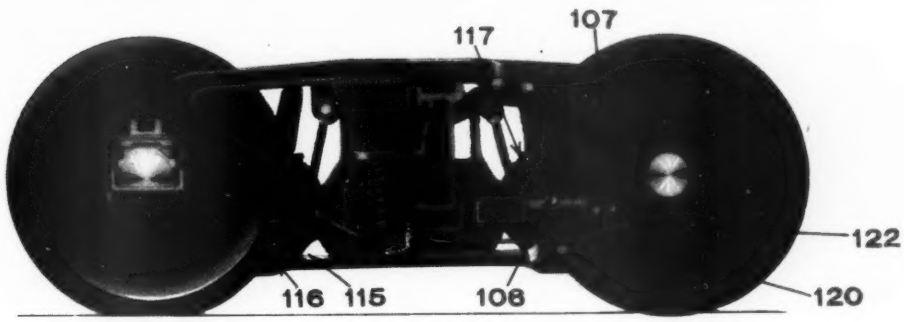
109—Cyli
nect
110—Floa
nect
111—Truc
112—Brak
113—Brak
114—Brak
115—Brak
116—Brak
117—Brak
118—Brak
119—Brak
120—Brak
pens
121—Brak
122—Brak
cast

Railway
Mechanical Engineer









Steel-Frame Box Car

109—Cylinder and truck-lever connecting rod
110—Floating- and truck-lever connecting rod
111—Truck bottom rod or spreader
112—Brake beam
113—Brake-beam truss
114—Brake-beam strut
115—Brake-beam head
116—Brake shoe
117—Brake-shoe key
118—Brake-beam hanger
119—Brake-beam hanger bracket
120—Brake-beam support or suspension spring
121—Brake-beam susp.-spring clip
122—Brake-beam support sliding casting
123—Hand-brake connecting chain
124—Hand-brake rod
125—Hand-brake chain
126—Hand-brake shaft step
127—Hand-brake shaft
128—Hand-brake shaft bracket
129—Hand-brake wheel
130—Hand-brake ratchet
131—Hand-brake pawl
132—Hand-brake step
133—Hand-brake step bracket

SAFETY APPLIANCES

134—Sill step
135—Handhold, Side
136—Handhold, End
137—Roof handhold
138—End ladder
139—Side ladder

TRUCKS

140—Truck wheel
141—Truck axle
142—Truck side frame
143—Journal box
144—Journal-box lid
145—Journal-box lid spring
146—Journal-box bearing
147—Journal-box wedge
148—Journal-box dust guard
149—Truck bolster
150—Truck-bolster center plate
151—Truck-bolster side bearing
152—Spring plank
153—Truck springs